THE BOOK *of* KNOWLEDGE

THE CHERUBS

This famous picture was painted by Sir Joshua Reynolds about 120 years ago, and now hangs in the National Gallery, London. It is interesting to know that the five heads were all drawn from a little girl named Frances Isabella, the daughter of Lord William Gordon.

The Book *of* Knowledge

The Children's Encyclopædia

EDITORS-IN-CHIEF

ARTHUR MEE
Temple Chambers, London

HOLLAND THOMPSON, Ph. D.
The College of the City of New York

WITH AN INTRODUCTION BY

JOHN H. FINLEY, LL. D.
Late President of the College of the City of New York
Commissioner of Education of the State of New York

DEPARTMENTAL EDITORS

All Countries
M. Alston Buckley

Natural History
Ernest Ingersoll

Plant Life
Edward Step

Book of Wonder
Arthur Mee

Familiar Things
Harold Begbie

Men and Women
Ernest A. Bryant

Our Own Life
C. W. Saleeby, M.D.

Famous Books
J. A. Hammerton

School Lessons
A. M. Skinner, B.S.

Poetry and Rhymes
A. Von Hartmann

Dominion of Canada
W. Peterson, D. Litt., LL. D.

The United States
Holland Thompson, Ph. D.

The Earth
Ivin Sickels, M.S., M.D.

Golden Deeds
M. Perry Mills

Stories and Legends
Edward Wright

Things to Make and Do
E. R. Sayre, B.A.

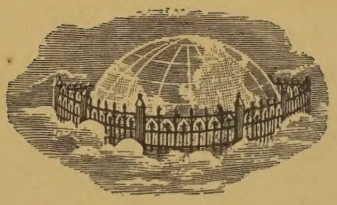
Volume VI

New York: THE GROLIER SOCIETY
London: THE EDUCATIONAL BOOK CO.

Text and Illustrations in this work are protected by copyright as follows:

Copyright, 1911, 1912, 1918, 1919, by THE GROLIER SOCIETY
Copyright, 1911, 1918, by THE EDUCATIONAL BOOK CO.
Copyright, 1910, 1911, 1912, 1918, 1919, by M. PERRY MILLS
Copyright, 1908, by AMALGAMATED PRESS, LTD.
Copyright, 1868, 1870, 1872, 1874, 1875, 1876, 1878, 1881, 1883, 1884, 1886, 1887, 1888, 1889, 1890, 1891, 1902, 1906, by TICKNOR & FIELDS, JAMES R. OSGOOD & CO., and HOUGHTON, MIFFLIN & CO.
Copyright, 1874, 1880, 1892, 1894, 1895, 1896, 1904, 1908, by CHARLES SCRIBNER'S SONS
Copyright, 1908, 1909, by THE CENTURY CO.
Copyright, 1897, by HARPER & BROS.
Copyright, 1906, by THE BAKER & TAYLOR CO.
Copyright, 1901, 1902, 1906, 1907, 1909, by H. C. WHITE CO.
Copyright, 1897, 1907, by THE AMERICAN BOOK CO.
Copyright, 1890, 1899, by JAMES WHITCOMB RILEY
Copyright by PHOTOGRAPHISCHE GESELLSCHAFT
Copyright by KEYSTONE VIEW CO.
Copyright by UNDERWOOD & UNDERWOOD
Copyright by BROWN BROS.
Copyright by BROWN & DAWSON
Copyright by B. L. SINGLEY

The poems by Thomas Bailey Aldrich, Phœbe Cary, Ralph Waldo Emerson, Oliver Wendell Holmes, James Russell Lowell, John Greenleaf Whittier, Henry Wadsworth Longfellow, Edmund Clarence Stedman, Richard Watson Gilder, John Hay, Edward R. Sill, Bayard Taylor and Celia Thaxter included in this work are reprinted by permission of, and by special arrangement with, Houghton Mifflin Company, the authorized publishers of the Works of these authors. The poems by Robert Louis Stevenson, Eugene Field, Mary Mapes Dodge, Richard Henry Stoddard and Henry Van Dyke included in this work are printed by permission of Charles Scribner's Sons.



CONTENTS OF THIS VOLUME

This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, color pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases the pages where these parts of our book begin are given. The full list of these things comes into the big index to the whole work.

PAGE

THE BOOK OF THE EARTH

The Making of Compounds . . 1693
Three Kinds of Compounds . . . 1813
Changes Always Going On . . . 1887

THE BOOK OF THE UNITED STATES

Washington, Our Capital City . . 1685
The Growing West 1831

THE BOOK OF FAMILIAR THINGS

The Flags of All Nations . . . 1657
How the Maps Are Made . . . 1765

THE BOOK OF WONDER

Why Does a Slate Pencil Write? . . 1653
How Can We Judge Distance? . . 1653
Why Can We Not Walk Straight with Our Eyes Shut? 1654
Are There More People Coming Into the World than Going Out of It? . 1656
Will the World's Food Supply Ever Run Short? 1656
What Makes a Motor-Car Go? . . 1787
Which Travels Quicker—Heat or Cold? 1790
Does Light Weigh Anything? . . 1791
What Is It that Causes Rust? . . 1792
What Brings Life Out of Dried Seeds? 1792
Why Are Some Plants Always Green? 1793
Why Are Soap-Bubbles Round? . . 1795
Where Does the Rainbow End? . . 1877
Could We Live Without Rain? . . 1878
What Makes an Eclipse of the Sun? . 1881
What Is the Milky Way? 1881
How Are Burglars Caught by Finger-prints? 1882
Why Do the Eyes in Some Portraits Seem to Follow Us? . . . 1884
Are All Animals Born Blind? . . 1885
Can a Fish Hear? 1885
Why Does a Bad Egg Float? . . . 1885
What Changes the Way of the Wind? 1886

THE BOOK OF NATURE

The Birds of the Ocean . . . 1639
The Birds of Beauty 1753
The Wonder of a Piece of Silk . . 1823
Nature's Winged Huntsmen . . 1893

THE BOOK OF CANADA

Some Important Buildings . . . 1768
Unknown Canada 1915

PAGE

THE BOOK OF MEN AND WOMEN

Men Who Mapped the Skies . . 1675
The Great Story-Tellers . . . 1745
Oliver Cromwell and Charles Stuart . 1857

THE BOOK OF OUR OWN LIFE

Life and the Lungs 1647
Fresh Air and Healthy Lives . . 1803
The Skin and Its Uses . . . 1921

THE BOOK OF GOLDEN DEEDS

The Girl Who Held the Fort . . 1671
The Heroism of Grace Darling . . 1743
The Man Who Saved His Son . . 1744
The Servant Who Saved His Mistress 1744
The Boy Who Saved His Family . 1744
The Race from Marathon . . . 1819
The Men of the Birkenhead . . 1820
The Swiss Guards Who Did Their Duty 1820
A Brave Ferry Captain . . . 1821
The Maid of Saragossa . . . 1953
The Elsie to the Rescue . . . 1954
A Brave Girl 1955
The Bear Hunt 1956
The Unknown Sculptor . . . 1958

THE STORY OF FAMOUS BOOKS

SCOTT'S WAVERLEY NOVELS.

When Knights Were Bold . . . 1663
The Lost Heir of Glenallan . . 1667
The Heart of Midlothian . . . 1773
Old Mortality 1776

THE BOOK OF STORIES

The Forbidden Room . . . 1699
Lady Anne Grimston . . . 1701
Brave William Tell 1703
Little Stories about Flowers . . 1705
The Ugly Duckling 1706
The Sleeping Beauty 1708
The Golden Apple 1710
The Magic Carpet 1710
Guy Fawkes and His Plot . . . 1807
Æsop's Fables 1809
Jack the Giant Killer 1810
The Little Pixies of Land's End . . 1812
The Bird-Girl with Golden Wings . 1812
The Lords of the Gray and White Castles 1903
The Story of Cupid and Psyche . . 1908
The Wishing Table 1910
The Treasure of Rhampsinitus . . 1912
Tales Told by the Indians . . . 1913

PAGE

THE BOOK OF POETRY

The Leak in the Dyke . . . 1797
The Charge of the Light Brigade . 1798
My Ships 1798
Counsel to Girls 1799
Tears, Idle Tears 1799
A Musical Instrument . . . 1799
Weighing the Baby 1800
The Happiest Land 1800
The Retired Cat 1800
Tom Bowling 1801
The Officer's Grave 1801
O God, Our Help in Ages Past . . 1801
Goblin Market 1867
Sir Sidney Smith 1871
The Rainbow 1871
Battle of the Baltic 1872
Lucy Gray 1872
By the Sea 1873
Snow-flakes 1873
God Moves in a Mysterious Way . . 1873
Elegy on the Death of a Mad Dog . 1873
Nurse's Song 1874
The Worm 1874
Jock of Hazeldean 1874
The Arming of Pigwiggen . . . 1874
True Growth 1874
A Cradle Song 1875
The Terrible Ball 1875
Sleep, Beauty Bright 1875
Little Verses 1802, 1876
The Pet Lamb 1925
Ginevra 1926
The Queen and the Flowers . . . 1927
To the Cuckoo 1927
A Song of the Camp 1928
The American Flag 1928
Douglas, Douglas, Tender and True . 1928
As Down in the Sunless Retreats . 1929
The Lorelei 1929
Afar in the Desert 1929
Like a Blind Spinner in the Sun . . 1929

THE BOOK OF ALL COUNTRIES

How India Became an Empire . . 1713
The British Empire in Africa . . 1781
Outposts of the British Empire . . 1931

THINGS TO MAKE AND TO DO

Flower Pots Made from Old Tin Cans 1736
The Vanishing Pillar Trick . . . 1737

PAGE

A Little Garden (end of September) . 1738
How to Care for Goldfish . . . 1739
A Simple Flying Machine . . . 1849
Making a Set of Doll's Furniture 1733, 1850
A Little Garden (middle and end of October) 1852, 1853
How to Follow a Trail . . . 1854
A Railway Train Built up from Squares 1855
Forfeits 1855
Thermometers 1937
A Game to Play at a Party . . 1938
A Picture-Frame that a Boy Can Make 1939
What to Do with a Piece of Paper . 1941
How to Make a Lavender Bottle . 1941
The Wandering Coin 1942
Measuring the Height of a Tree . . 1943
What to Do in a Thunderstorm . . 1943
A Little Garden (middle of November) . 1944

THE BOOK OF SCHOOL LESSONS

READING

The Meaning of Singular and Plural Numbers 1721
Primary Reading Lesson . . . 1723
The Meaning of Words . . . 1945

WRITING

More Letters Below the Line . . 1725
Learning to Write Little Words . . 1946

ARITHMETIC

Adding the Numbers Together . . 1726
Adding Big Numbers Together . . 1947

MUSIC

The Fairies Inside the Shells . . 1727
King Semibreve and His Court . . 1949

DRAWING

The Right Way to Draw a Box . . 1729
How to Draw with Both Hands . . 1950

FRENCH

Little Picture Stories . . . 1731, 1952

COLORED PLATES

The Cherubs . . . *Frontispiece*
Flags of All Nations 1659
The American Flag 1661
The Wonderful Colors of Birds . . 1752
Characteristic Eggs of American Birds 1756
Eggs of Well-known English Birds . 1760

WHAT THIS STORY TELLS US

THE sea-birds are in some ways the most wonderful of all living creatures. Some of them can move as quickly on foot about the land as many of the animals. They swim as lightly as corks in the deepest seas, in the fiercest storms. They dive like fish. To crown all, they fly with an ease and grace and strength which nothing else can match. They find their food where no land animal, no matter how powerful, could live for more than a few moments. No matter into what seas our ships go, there they find some sort of bird giving life and beauty to the scene. The powers of these birds make man feel that Providence, when it made him lord of the earth and the waters, was very mindful of the needs of the inferior creatures. Here we read of some of the most wonderful of these birds.

THE BIRDS OF THE OCEAN

CONTINUED FROM 1566

IF we all had to vote for a king of the sea-birds, we should probably agree to crown the albatross. It is not the bravest of the sea-birds. A sea-eagle will readily beat it; so will some of the vicious gulls. But for the perfection of flight, for the beauty of its appearance as it sails the air, and for its unwearying strength, the albatross must have the first place. There are seven species of it, one of them so dull in color that it is commonly called the sooty albatross. The one most generally known is the albatross which, from its great flight, is called the wanderer.

It is about 4 feet long, but its outspread wings measure from 10 feet to 17 feet from tip to tip. They are not great broad wings, like those of the eagle, but narrow, though, of course, very strong. With this great spread of wings the albatross cannot easily get a start on level ground. It likes a rock as a starting-point, unless the wind be blowing. In the latter case the bird faces the wind, and rises against it like a kite.

One day a traveler, walking over an island where many albatrosses were hatching their eggs, found that one bird had dropped into a pit. This pit was 60 feet across, and 30 feet deep, but the bird could not fly out. There was not room enough for its great wings to raise it into the air, and the traveler, climbing down, had no difficulty in catching it and returning it to the high ground where it could fly. It is in the air that the albatross appears at its best. On land, where it is nesting in thousands and thousands, the bird seems as dull as a penguin. But in the air it is a king indeed. A few flaps of its mighty wings send it high into the air over the sea. There it sails like a beautiful ship of feather and muscle. It barely moves its wings at all. It seems to hang in the air, and to float and glide without any effort. Men have watched it for hours and not seen it shift its wings.

Of course, it *does* move them, if ever so slightly; for if it makes the wind carry it, as it is said to do, it must make slight alterations in the position of the wings to enable them to catch the wind and make it carry it in the direction it wishes to follow. But for straightforward flying it is just as much a master. One has been known to follow a swift steamer for hundreds and hundreds of miles, circling in great flights round and round the vessel, on the look-out for any food that might be thrown overboard. The albatross likes live fish, jelly-fish, and other marine creatures; but it is not dainty. It will eat the flesh of a dead whale, or anything too bad to be kept on board a ship. In this way it acts as an ocean scavenger. When it has fed, it swims, dazed, upon the water, and may easily be caught, unless, as often happens when it is pursued, it throws up its food so that it may fly off.

The nearest allies of the stately

Copyright, 1908, by Amalgamated Press, Ltd.

albatross are the gulls and the petrels and the auks. Indeed, the albatross is the greatest of all the petrels, although there is one, called the giant petrel, which is not much smaller. The most interesting of these birds of many varieties are the smallest, the little stormy petrels, or Mother Carey's Chickens as the sailors call them. They are the tiniest of all web-footed birds, being no bigger than large swallows.

The nature of a bird is often told in a common name, and the name "petrel" has a history. Petrel is another form of Peter, and the bird gets this name because it seems to walk upon the water, as Peter the Apostle was permitted to do. No matter how rough the sea or boisterous the gale, there the little bird is to be seen, far out at sea, lightly tripping up and down the waves. It flutters its fine wings only just enough to give its feet the support which they need to keep its light little body afloat. Thus with swift, light feet and fast-flapping wings it skims the waves, greedily feeding upon the little creatures which the stormy waves bring to the top of the water, just before and just after a storm. Those are its most active times, and sailors, noting this, think that the bird causes the bad weather at sea.

THE PETRELS WHOSE HOMES AND HABITS HAVE PUZZLED MEN OF SCIENCE

Even learned men do not know nearly all that there is to be learned about the petrels. It was always supposed that the fork-tailed petrel of Canada never left the vicinity of the Canadian coasts, but suddenly one turned up in England. Another man found the same breed of birds in the Sandwich Islands, and thought that they lived only there; but since then specimens have been received at the British Museum from four different parts of the world. Another petrel variety which was supposed never to leave Fiji has been found in Wales.

The stormy petrel, like the shear-water, another of the same family of birds, may be seen in large flocks far out at sea, enjoying the stormy weather. Most of the petrels skim the waters, but the diver petrels go far down, and dash among the fish which do not come to the surface. The Cape pigeon is really a petrel. Most of the small petrels nest in little burrows, but some lay their eggs on rocky cliffs, bits of stone serving for a nest. When sitting on its nest, it looks exactly like a chequered homing pigeon, but not when we see that its feet are webbed. The beautiful showy petrel rests on rocky ledges on the sides of dizzy precipices, content with bits of rock and pebbles for a nest.

THE UNPLEASANT WAY IN WHICH THE GIANT PETREL KEEPS OFF ENEMIES

The Antarctic giant petrel, which weighs eight pounds, makes a large nest of stones, and, like the albatross, does an unpleasant thing if attacked. It has the power to withdraw food from its stomach, and to scatter it over the man who goes near. Even the young ones when alarmed can squirt nasty oil from their nostrils to a distance of three or four yards. The giant petrel loves penguin eggs and young penguins, and works havoc among wingless birds.

But the giant petrel is less feared by the penguins than the sheath-bills, which have an uncommon share of the trickery that many of the sea-birds possess. They are not nearly the size of the penguins or the cormorants, being more like large white pigeons, yet they are terrible worries to these large birds. The sheath-bills make their nesting-places in the same rocky, frozen Antarctic islands where the penguins and shags or cormorants make theirs. Now, as the penguins or shags sit upon their nests, a couple of sheath-bills will saunter along, hunting together as wild animals hunt. One of the robbers will walk in front of the nest, and there engage the attention of the sitting bird, causing it to reach forward to attack the sheath-bill nearest her beak, and in so doing, leaving her eggs uncovered at the back. The sheath-bill in the rear will then make a grab at the eggs with its sharp bill. The two robbers then march on, and change places at the next nest, so that both, by taking turns, get their share.

THE PIRATE SKUA, WHICH STEALS THE FOOD OF OTHER BIRDS

A still more audacious foe is the skua. The skuas are a form of gull, and the third largest of the sea-birds. First there is the albatross, which measures 4 feet from beak to tail; next comes the giant petrel, which is 32 inches long and 5½ feet across the wings; then comes the skua, measuring 24 inches and more, and with a splendid stretch of wing. It

GREAT BIRDS THAT HUNT IN THE SEA

Though a goose-like bird on its nest, the albatross, when flying, is the picture of strength and grace.

Seen on the rocks, the Cape petrel is like a pigeon, but its feet are webbed and it swims like a sea-gull.

When winds lash the seas, tiny sea animals are washed to the surface. The stormy petrel feeds on these, running and flying on the surface of the waves.

Next in size to the albatross comes this giant petrel. Its nostrils form horny tubes on the upper surfaces of the beak. Its wings measure nearly six feet across.

The sheath-bills are birds to be found on the land in the great, cold Antarctic regions. They are clever, cheeky birds, and cunningly rob other birds' nests.

Skuas are scavengers. They eat decayed flesh, but young penguins and other young birds too. They fight with their webbed feet, which have claws.

is a family of several species, some of which make their nesting-places in the frozen regions, while others are far scattered over the warmer seas. But wherever they are, the same nature rules them. Their proper food is fish, but they eat also the flesh of whales which have been killed; they will eat dead birds and animals; they eat the eggs of other birds, and find young birds quite to their liking.

Seeing that skuas like fish, it might be thought that they would prove expert fishers. But that is not so. They are pirates who rob other birds of their gains. Although their feet are webbed, they have sharp claws, and use these to attack other birds. When a small gull catches a fish, the skua makes a dart at it in the air, and attacks it with such fury that the smaller bird is glad to drop its fish and flee. No sooner does the fish drop from the mouth of the gull, than the skua descends like a hawk, and snaps it up before it can reach the water. Thus, where there are many small gulls and terns on the look-out for fish, there, too, may many skuas be expected, ready to steal the food from their smaller relations.

THE BIRDS THAT EAT DEAD BIRDS, AND THE GULLS THAT FOLLOW THE PLOUGH

They are the scavengers of the penguin rookeries. Many penguins are killed in the course of the year, and their bodies left to become corrupt. Skuas pounce down upon the dead birds and devour their bodies. They help, too, to get rid of the dead bodies of animals on land and in the sea. Flesh and fish are food to them, and nothing else. The effect is, however, to prevent dead bodies of beasts and birds from making the air corrupt. All things die in time; but no matter where death occurs, there is some form of life to consume the remains, unless, indeed, the body be sealed up in ice or mud. It seems a merciful part of the plan of Nature not to have the evidence of death about, and the fierce birds with hearty appetites are but her agents in carrying out part of the work.

Many of the sea-birds are never seen by people who do not make voyages across the ocean. That is not the case with the gulls. Some of these come far inland; though their proper home is the sea, yet they like grubs and worms and insects that live in the soil. By constant observation they have found out that when the farmer ploughs his land, these things, which form good food for gulls, are turned up. So it is quite common to see a crowd of splendid white gulls gracefully following the plough to pick up the living things which the plough brings to the surface. This, of course, occurs mostly near the sea, or near some big lake; yet gulls dwell far in the interior, as about the prairie lakes of Dakota.

BIRDS THAT MAKE ANIMALS BLIND AND THEN DESTROY THEM

The small gulls are content with a diet of worms, and so forth, but the large ones are as bad as the bad ravens and the eagles. They eat rats and mice, which is just as it should be; but when they kill and eat useful birds, then their visits become unwelcome. Still worse is it when they attack lambs and baby deer. They peck out their victims' eyes, so preventing the poor creatures from seeing a way of escape, and causing them great agony. The large black-backed gull is the worst of the thieves and murderers. This is a bird measuring 28 inches from beak to tail, and that it is very powerful, the fact that it can kill lambs and birds is sufficient evidence.

Many gulls have become regular visitors to London. They are to be seen flying along the Thames nearly all the year. They are very tame, and it has become the custom for people on the Thames Embankment to feed the gulls with fish and other forms of food.

The black-backed gulls, the black-headed gulls, the herring gulls, and the kittiwake gulls are all to be seen in winter, at the seaside, haunting the rivers and marshes, or even in the fields far inland, in spring and autumn. Some of them, like the black-headed and black-backed gulls, make their nests among marshes, where they build with rushes and grasses high enough for the nest to be free of water.

THE GULL WITH A NEST OF SEAWEED, AND THE SEA-SWALLOW

The kittiwake gull, so called because its cry sounds like "kitti-wake," builds its nest of seaweed on tiny ledges of rock high up on cliffs overlooking the sea. The ivory gulls, whose pure white feathers are set off by their jet black eyes, sit

BIRDS THAT CATCH FISH AND KILL LAMBS

The black-headed gulls are generally to be seen off our coasts. They make their nests in the marshes.

Black-backed gulls like sea-food, but are strong and savage, and kill lambs by pecking out their eyes.

Herring gulls follow shoals of herrings, and, diving into the water, catch them as hawks catch their prey.

The kittiwake gulls spend their days on the sea, and have their nests in the wildest, rockiest places.

The tern is the smallest of the gulls. It flies and darts so swiftly that it is called the sea-swallow. Its forked tail increases its likeness to a swallow.

The black tern is a common bird in some places. In marshes it makes a strong nest of loose vegetation which may float if water rises around it.

The photographs on these pages are by Lewis Medland, W. P. Dando, R. B. Lodge and others.

on their nests and hatch their eggs with snow and ice all around them. One family of gulls we have not yet thought of. That is the tern, or sea-swallow. The name sea-swallow gives us a good idea of its looks. It has a longer, straighter beak than the ordinary gull, and the tail of most species is long and forked, like that of the true swallow. Terns are even more numerous than gulls, and are to be found near the sea in all climates. They fly with the darting speed and skill of the land swallow, but, though as eager as their namesakes to snap up insects, they live chiefly on fish.

How the sea-swallow's enemy robs it of its food

As we have noticed the long beak of the tern, the beak of the skimmers may help to keep their peculiarity in mind. Their bills are long, but the lower half is much longer than the upper. The two halves work like a pair of scissors, and the birds are called scissor-bills. When flying low over the water they keep the long lower half of the beak in the water, searching for food in this way as they fly. As the tern is so numerous and such a busy feeder, naturally it has enemies. The most daring is, perhaps, the tropical frigate bird.

This is a bird which flies far out to sea, not to fish, but to rob other birds which have fished. It attacks the terns and gannets, or solan geese, as the skua attacks his victim, and frightens the little sea-swallow or the big gannet into throwing up at least a share of the fish which it has caught. Sometimes the frigate bird has been seen to hide in trees on the cocoa-nut-bearing islands, where many of these birds make their homes, then sail out at night to meet the home-coming wanderers, and make them give up their food. If the gannet proves at all unwilling, the frigate bird takes him by the tail and gives him a good shake, which always has the desired result.

The handsome tropic bird with ivory feathers, & the little auks

A bird in many ways resembling the gull and the frigate bird is the handsome tropic bird, one of the loveliest of sea-birds, with ivory feathers tinged with pink, except at the tips of the wings, where the feathers are black; and around the eyes, where again the feathers are black. The tropic bird has two elegant streaming feathers in its tail, more like the feathers of a pheasant than those of a bird which passes its life seeking food in the boundless southern ocean.

Sea-gulls are the descendants of the birds from which our field friends the plovers came. The plovers are older than the gulls in the history of creation, and it is pleasant to find both branches of the family flourishing.

When we come to the auks we find a different story. We have the razor-bills, the guillemots, and the funny-billed puffins still prosperous, but the chief of the auks, the famous great auk, is no more. It forgot how to fly, and men killed every member of the race, though the bird once throve in millions. The other members of the family have kept their wings for flying, and, as they nest far in the North on high sea cliffs, they are safe. In the old days great auks were occasionally found nesting with the razor-bills and guillemots. The smaller birds did not seek such heights then as they do now, or the great auks could not have reached their nesting-places. Birds of different sorts still nest together, while others have nothing in common.

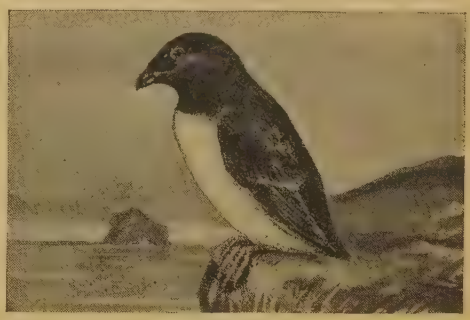
Why the guillemot's egg does not roll over the cliff

Thus we find one station, or one line of ledges or rocks, occupied by the nests of the guillemots, another by the razor-bills; the puffins take a third distinct series of rocks; the kittiwakes make the fourth part of the colony, while the highest and most difficult rocks of all are occupied by the herring gulls. There seems much confusion when the birds are arriving, and courting, and claiming their nests, but in reality all is in order, and each species of bird keeps together.

Although they live close together, the razor-bill and the guillemot have different methods of nesting. All that the razor-bill does is to find a rock which affords a rough protection for the one egg that it lays. The egg is deposited upon the bare hard rock, but there must be a nook or cranny in the rock to prevent the egg from rolling away and crashing down over the cliff. The guillemot needs not even this scanty guard. So long as the rock is high enough above the heads of men, and far enough from his haunts,

SOME BIRDS THAT CAN FLY AND DIVE

Frigate birds fly beautifully, but they are lazy and rob other birds of the fish they have caught.



The little auks make their nests in the frozen North, but take their little ones, when hatched, to warmer seas.

Guillemots, when grouped together at their nesting-places, look like penguins; but the guillemots fly, penguins do not. They live night and day at sea, but come to land in hosts to lay their eggs and rear their young.

The puffin has a great colored beak, looking far too big for its body. It is called the sea-parrot.

The razor-bills always nest near the guillemots and puffins. In winter they come as far as Long Island.

The great northern diver, when seeking fish for food, can stay under water for eight minutes at a time. Though so alert at sea, the bird walks very badly.

Gannets, when flying, see fish in the sea, and plunge from a great height into the water to catch them. Their bodies have air-sacs to protect them from injury.

the guillemot is satisfied. It deposits its egg on the bare rock high up on a precipice, and there seems no reason whatever why the egg should not roll away and smash.

But there is a very good reason. The egg is long, very broad at one end, and pointed and narrow at the other end. When the egg is disturbed, it does not roll away as a round egg would. It simply rolls round in a little circle. If it were not for this safeguard the guillemots would soon become extinct. Every movement of the bird would be sufficient to send an ordinary-shaped egg to destruction, and there would be no young guillemots.

BIRDS THAT LIVE AT SEA AND COME TO LAND ONLY FOR NESTING

Where we see guillemots we may look for razor-bills. They are related, of course, but in appearance they are different. The razor-bill's beak is not so straight and slender as that of the guillemot, and it has not the cross grooves which that of the razor-bill has. There are guillemots in which the color of the head and back and wings is of smoky brown. Others are black instead of brown. The habits of all are the same. They practically live on the sea, coming to land only for the nesting season, or when they are driven from the sea by the violence of the gales.

They eat fish, particularly young herrings and pilchards, and have so good a life that they are to be seen in countless swarms off our rocky coasts, and at the mouths of great rivers. Farther away there are smaller guillemots. The little auks breed only in the frozen North, and visit the Canadian coasts in the winter. There is a tufted Alaskan auk, which has feathers on its nose like a crest growing the wrong way about—forwards, instead of back over the head. Another little auk has a horn-like knob above the nostrils, possibly to act as a protection.

THE FUNNY LITTLE BIRDS WITH THE BIG BEAKS, AND THE HANDSOME DIVER

These descriptions sound comical, but the birds themselves are not nearly so funny-looking as the puffins, or sea-parrots. These have great horny, colored bills, absurdly large for the small size of the bird's body. It looks as if Nature had meant to make a great bird, but, after making the beak of one, altered her mind and made the little bird grow on to the end of the beak intended for the big bird. In spite of their funny looks the puffins have quite a good time. They fly, swim, and dive beautifully.

But the most famous of all the diving birds is that called loon, or great northern diver. This is a very handsome bird, measuring almost a yard in length. It is the perfection of grace in the water, and the finest diver in feathers. It can remain under water for eight minutes at a time, then pop down again as soon as it has taken a breath. It flies fast and straight when making for the Arctic regions to nest, yet its legs are so far back that it can hardly walk.

But the champion high diver is the solan goose, or gannet. This is a bird a little larger than the diver, and resembling a graceful goose, with a long and powerful bill. It breeds in swarms upon the sea-cliffs of Newfoundland, and on the Bass Rock in the Firth of Forth, and is rather an enemy to the fishermen. It eats so many herrings that the fishermen say it drives the fish away.

THE AIR-CUSHIONS THAT PROTECT THE GANNET WHEN IT DIVES INTO THE SEA

But, at any rate, the gannets act as a signal to the men. The men watch the gannet flying high in the air. Suddenly they see it dash with amazing speed from aloft right down into the water. The gannet has air-sacs in its chest, which act as a pneumatic cushion, and prevent it from being hurt on making these great dives. There used to be still larger gannets with wings greater even than those of the albatross.

Very few of the sea-birds can be eaten, so fully charged with fishy oil is their flesh. Hence they are not often in the same danger of extinction as the poor penguins, thousands and thousands of which are yearly killed and boiled down for oil. If there were not savage members of the sea-bird family, the number of birds might become possibly too numerous. Nature, however, settles the problem herself. Here, as in every other branch of life, she sets her safeguards against too great an increase.

THE NEXT STORIES OF BIRDS BEGIN ON P. 1753.

WHAT THIS STORY TELLS US

EVERY living thing must breathe, and now we come to study the lungs, the organs of breathing in ourselves and in all the higher animals. The real breathing or burning is done inside the living stuff called protoplasm, but the oxygen it needs is taken in by the lungs. These lie in the chest on a living floor of muscle which moves up and down as we breathe. The air enters the nose—or, when we breathe wrongly or in a hurry, by the mouth—and is there warmed, filtered, and moistened. Then it passes through the voice-box and into the tubes that lead right into the substance of the lungs. So it reaches the air-cells, as they are called, and there it comes near the blood which the heart has pumped to the lungs to meet it. We breathe by sucking in the air, and if we are wise we are careful never to wear any tight clothing over our breathing muscles, but we allow them free play in their ceaseless work of sucking into our lungs the air which our blood must carry to every part of the body for its life.

LIFE AND THE LUNGS

CONTINUED FROM 1598

WE have already learned that every thing must breathe, and that one of the reasons why the blood circulates in us and in all the other animals that have blood is to carry certain gases to and from the lungs. We have also learned that the real breathing is not in the lungs at all, but in the tissues of the body, where burning goes on. The proper name for breathing is respiration, and real breathing is called internal respiration. We may say a word of two more about it before we consider the lungs and how they should be used.

It has been found that there is a great difference between ordinary burning and the way in which protoplasm or living matter breathes. In ordinary burning, the oxygen just comes to the outside of the coal, or whatever it is that burns, and is then combined with it; but living protoplasm does not burn in this fashion. It takes the oxygen brought to it by the blood right into itself, and probably does many wonderful things with it, producing all the time the changes which are life, before at last it gives the oxygen out, combined with carbon to form carbon dioxide gas, CO_2, and combined with hydrogen to form water, H_2O. Thus we say that the breathing of protoplasm is inside its molecule, and since the word *intra* is Latin for *within*, the proper way of stating this is to say that the breathing, or oxidation, of protoplasm is intra-molecular. It does not matter if you forget the word if you remember the fact. Now let us turn to the lungs.

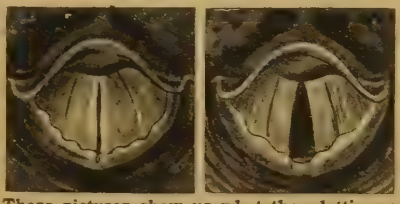
We have seen that the heart lies in the middle of the chest, and has one lung on each side of it. We must now learn what makes the floor of the chest, for we shall find that this is a living floor, and that, indeed, the lungs cannot be used without its help. It is a flat sheet of muscle stretched right across the middle of the body. There are a few openings in it, through which pass veins and arteries and nerves, but otherwise it is a complete partition between the upper and lower halves of the trunk. It has a rather curious name, which, however, is used for many other purposes: it is *diaphragm*, pronounced *di-a-fram*, and meaning "across to fence." It is used for anything *stretched across*.

This picture shows us the position of the lungs and their exact size in relation to the rest of the body.

Copyright, 1908, by Amalgamated Press, Ltd.

This diaphragm in our bodies has been described as flat, but really, as the picture on page 1651 shows, it is dome-shaped. It is a living floor, for it is a muscle. When it contracts it becomes more nearly flat, for it presses downwards. This, of course, means that everything beneath it is pressed upon, and as this muscle acts every time we breathe properly, you will notice in yourself that when you take a long breath the lower part of your body bulges forwards. That is because the floor of the chest, which is also the roof of the lower part of the body, has moved downwards and become flatter, so that the abdomen, as the lower part of the trunk is called, has to bulge forwards.

Upon this diaphragm, then, there rest the heart in the middle, and the two lungs. The part of each lung that rests upon it is called its base; it is the widest and broadest part of the lung. If we look at the base of each lung and then follow it upwards, we shall see that it becomes narrower and smaller, until at last it ends almost in a point which actually comes up near the neck behind the collar-bone. It is important to remember that the greatest bulk of the lung is its lower part, for there are two ways of breathing—one which fills the upper part of the lung with air and one which fills the lower part; and we see, of course, that it must be better to breathe in the way which fills the biggest and roomiest part of the lung. Now let us begin at the very beginning of the act of breathing, and see where the air goes.



These pictures show us what the glottis, or voice-box, looks like. The vocal cords, shown in white, tighten to close the box more, and loosen to open it. When the box is almost closed the pitch of our voice is high; when it is opened wider our voice is lower.

THE CHANNEL THROUGH WHICH THE AIR ENTERS INTO OUR BODIES

There is a perfectly definite channel for the air from the outside world to the lungs, and if we are wise we always breathe by this channel. The opening of it is the nose. Now, this is very important, for it so happens that we, unlike some animals, can also breathe through our mouths, and though there is no objection to doing this sometimes, we should know that the mouth is the opening of the canal that has to do with food, whilst the nose is the opening of the canal that has to do with air. Each opening is provided with suitable arrangements for its special purpose. The mouth contains teeth and all the arrangements for tasting; the nose contains little hairs for filtering the air; it contains all the arrangements for smelling, and, as we have seen, it has a wonderful loose lining which can be flooded with blood so as to warm the air before it enters our lungs.

THE WAY IN WHICH THE AIR IS FILTERED AS IT COMES INTO OUR LUNGS

But this is not all. If we trace out the passage of the air through the nose, we find that, instead of being straight and open, it is extraordinarily twisted and roundabout. You would not think that this was an advantage, but it is a great advantage. For one thing, it compels the air to pass over a great surface which has warm blood underneath it, so that the air is warmed, and it means, also, that a good deal of water vapor—that is to say, water in the form of gas—can be added to the air if it does not already contain enough. That is good, for perfectly dry air is very irritating to our lungs, and dries them up in a very unhealthy way. Lastly, this long, twisted, in-and-out passage for the air makes a splendid filter. A very large quantity of all the dirt in the air, and of any microbes that may be in it, is stopped by this filter, so that the air which is allowed to pass on to the lungs is not only nicely warmed and moistened, but is greatly purified. Experiments have been made which show that when, by means of a tube passed into the mouth, we withdraw the air which has been through the nose filter and is on its way to the lungs, no microbes can be found in it—though it may have had hosts of microbes in it when it entered the nose.

It follows, then, that it is the duty of every one of us to breathe through the nose. Now, the passage of air is easier through the mouth than through the nose, just because the mouth does not trouble to filter it; hence if you keep

your mouth open, air is sure to enter through it when you breathe. The rule, then, must be to keep the mouth shut. It should be opened when we have something to swallow, and it should be opened when we have something to say. In this latter case air passes through the mouth, but it is passing not inwards but outwards.

A MOST IMPORTANT THING IN LIFE IS TO BREATHE THROUGH THE NOSE

There are few more important lessons for health than this lesson that we should breathe through the nose, and not through the mouth, as a rule. Every child should be taught this lesson, and the way to learn it is to learn to keep the mouth shut. It does not take long before this becomes a habit which we soon cease to notice and need not think about again. All over America there are unfortunate children whom their school-teachers think stupid, who are not as tall and heavy as they should be for their age, who suffer from frequent colds and sore throats, and so on, simply because they have something the matter with their noses, which can easily be put right, but which, if it is not put right, prevents them from breathing properly through their noses as everyone should, and so goes far to spoil their lives. I do not think there is anything in this book more important than this rule that we should breathe through the nose.

These diagrams show the positions of the passages through which air and food enter our bodies. The air enters through the nose, and is purified in the three white passages, then passing down to the glottis and on to the lungs. The left picture shows what happens when we choke. The epiglottis, the little trapdoor which drops and closes the windpipe when we swallow, has not been quick enough, and a piece of food has been caught.

After passing through the nose filter, the air streams into the throat at the back of the mouth, and passes into the voice-box, the front of which you can feel in your neck. This voice-box has two folds of tissue stretched across it from each side, with a tiny chink between them. Every time we breathe in air, the brain sends an order through certain nerves to the muscles which govern these little folds, or vocal cords, as they are called, and they swing widely apart, so as to leave a large space through which the air can pass without making any sound.

We all know what a choking fit is. What happens then is that something or other which has got into the voice-box has thrown this beautiful arrangement out of order, and the vocal cords, instead of separating to let us breathe, are thrown together so that the air can scarcely force its way between them. In doing this it sets them trembling or vibrating—just as it ought to do on its way out when we speak or sing—and so makes those horrible little noises which we all make at these times.

But though we feel very miserable during a choking fit, we need not be afraid, for as soon as the brain finds it is getting too little oxygen in the blood brought to it, it *always* orders the vocal cords to relax, and in a moment we find that we can take a long, deep breath quite easily. Of course this cannot save us in the rare cases where a lump of food or something has got actually stuck in the top of the voice-box, so that the air cannot get past it. This is the only serious kind of choking. I have called it rare, and it is rare compared with ordinary choking fits, but it really happens often, and kills many people.

HOW WE MAY SAVE OURSELVES IN A CHOKING FIT

If we have all learned at school the simple things which really matter, and cannot be forgotten, no one need ever be killed in this way, so long as anyone else is present. Indeed, one could save oneself. The top of the voice-box is so near to the mouth, after all, that anyone can be saved by a forefinger quickly and boldly passed into the mouth so as to remove the obstacle. This needs

no skill, but only courage, and anyone who knows it may, in such a case, save the life that is dearest in the world to him or her.

Of course, little specks of food often find their way, as they should not, into the voice-box, but the result of that is to make us cough violently, which means sending up a great blast of air from the lungs, and that blows the obstacle away. It is very small babies and very old people who are most apt to be choked, for they cannot cough strongly. Also there is a terrible kind of sore throat called diphtheria, in which something is apt to form that blocks up the opening of the voice-box, and used to choke many children; but there has been found a wonderful medicine which really cures this disease. When it is used in time it probably never fails.

It is a curious thing about the body, that, of the two passages in the throat, one for the air and one for the food, the food passage lies behind. This means, of course, that everything we swallow has to be made to jump across the opening into the lungs through the voice-box. We find this very easy, because the act of swallowing is such a wonderful one, little though most of us think about it. It depends upon the beautifully balanced use of scores of nerves and muscles. If we laugh or try to talk just when we are swallowing, of course we throw this beautiful machinery out of order, and instead of everything passing safely over the opening that leads to the lungs, some of it is apt to get in.

This is what our lungs are made of—what we should see if they were cut through. The broad dark tubes are veins and arteries, and the little ones are capillaries.

THE TWO TUBES THROUGH WHICH OUR BREATH GOES TO THE LUNGS

After passing through the voice-box, the air flows down the windpipe. This is a large round tube which you can readily feel for yourself in your own neck. Just below the big part of the voice-box there is a sort of ring, easily felt, which is really part of the voice-box itself, and below that you can feel the round tube running away down into the chest. If you feel carefully with the tip of your finger, you will find that this round tube is made of a number of little rings. This we usually call the windpipe, and its special name does not matter. After it has passed down some distance, it divides into two tubes, one going to the right lung and the other to the left. Each of these in the substance of the lungs divides up again and again like a tree. These tubes are called the *bronchi*, a name which we can all remember, as when they fall ill we call the trouble bronchitis. As they subdivide, of course, the branches get smaller and smaller, until at last they become quite tiny, and then we find that they end in a countless number of little buds, as we might call them, which are known as the air-cells.

HOW THE LUNG IS WONDERFULLY MADE WITH A SURFACE OF 2,000 FEET

These are not what we have learned to understand by the word cells, but little hollow spaces lined with living cells and containing air. Thus a little bit of tissue from the lung will float, unlike any other tissue of the body, for from the first breath that a baby draws, the lungs become filled with air, which never wholly leaves it. The air-cells are lined with smooth, flat, living cells, through which the gases have to pass as we breathe. They are exceedingly thin, and immediately underneath them runs a rich supply of tubes containing the blood which is to be purified. This means, then, that the gases have to pass through two layers of cells—the layer that lines the "air-cell," and the layer that forms the wall of the capillary or tube.

The structure of the lung is beautifully adapted for its purpose. Men have tried to measure the extent of surface where the blood is exposed to the air in the lungs, and they say that, in consequence of the way in which the lung is made, this surface would actually measure, if it were stretched out, 2000 square feet. Of course, it is evident that if the lung were simply a big hollow space it would only have two or three square feet of surface, but as it is made rather like a sponge, the surface of it is increased to this enormous extent so that there is space enough for the blood to be purified.

If we could see the lung of a new-born baby, we should find it pearly white in color, but tinted with pink by the blood;

if there were no blood in it, it would be perfectly white. The lung of an Esquimau, if he has never breathed coal-dust and smuts, is the same color as that of a new-born baby; the lung of a coal-miner is quite black, owing to the large quantity of black coal-dust that he has been breathing. His nose cannot keep out everything, and all the particles it fails to keep back, which get into the lung, stay there, except that a few of them are picked up by the white blood-cells, and may be coughed up and so got rid of. The lung of an ordinary city-dweller is slaty grey—about half as dirty as the coal-miner's.

THE LIVING OARS OF THE LUNGS THAT DRIVE THE DUST BACK

It is one of the most important duties of the lung to keep itself free, as far as possible, from any foreign matter; the air-passages must be kept clear and open and without obstruction. There is a beautiful arrangement that helps this. If we look through the microscope at the cells which line the windpipe, and the bronchi, almost down to where they end in the air-cells, we find that they are lined with cells of a particular kind. These have a number of tiny little things like living oars sticking out from them; they look rather like eyelashes, and so are called after the Latin word for eyelashes, which is *cilia*.

Here we see what happens when we breathe. When we breathe in, the diaphragm lowers, the ribs rise and move forward, thus making room for the lungs to expand as pure air rushes into them through the windpipe. This is shown in the left picture. When we breathe out, the diaphragm goes back to its arched shape again, and the ribs are lowered, while the poisonous gases from the blood are driven out.

All these living oars, or cilia, lash in the same direction, and that is upwards. They do their best, then, to push upwards as much as they can of the dust and dirt we breathe, and then when we cough, we get rid of these. But the lung of the coal-miner and the lung of the city-dweller prove that, in spite of the nose filter, and the white cells, and the power to cough, and the cilia of the cells that line the windpipe and bronchi, it is still impossible for the lung to keep itself clean if, day after day, we breathe the dirt with which the air of cities is filled. A great feature of the tissue of the lung is that it is elastic. This is due to the fact that it contains a great quantity of the special kind of tissue which we find in the body wherever elasticity is wanted. This tissue looks yellow under the microscope, and is made up of tiny threads which can be seen to curl up if they are loosened out. The lung is rich in this elastic tissue, and this is most important, since it has a great deal to do with the act of breathing. We are going to talk about that in a moment, but here I may say that the act of breathing out costs us in health no trouble or effort at all, since it very largely depends upon the elastic recoil of the stretched lung itself.

A grown-up man breathes about fifteen or sixteen times in a minute; a woman perhaps eighteen times in a minute. Children breathe much more often than this. Breathing has two parts—breathing in and breathing out. The first is called inspiration, and the second expiration, and now we must learn how these acts are performed.

The muscles of breathing are very numerous: indeed, in what is called forced breathing almost every muscle of the trunk is used, but in ordinary breathing we use simply the diaphragm and the thin muscles between the ribs. Much the most important of these is the diaphragm, and it is important to give the diaphragm free play in breathing. If we wear tight clothes round the waist, the diaphragm is interfered with, and we can only breathe by using the ribs.

WHY IT IS HARMFUL TO WEAR OUR CLOTHES TOO TIGHT

Until lately this deceived the students of the body, who used to say that boys and girls and men breathe mainly by the diaphragm, but that women breathe mainly by the ribs. We know now that that is quite untrue. Everyone who is

properly dressed breathes mainly by the diaphragm. It is only because many women wear their clothes too tight that the movement of the diaphragm is interfered with, and so they have to breathe by their ribs.

When we breathe, then, an order is sent to the diaphragm from the brain, and it becomes flattened. This acts like what is called a suction pump. The amount of room in the chest is increased, and the air from the outside is sucked in.

THE TWO MUSCLES THAT MUST BE ALWAYS MOVING IF WE ARE TO LIVE

We have already seen that, at the same moment, the brain, which governs the whole process, sends an order down to the voice-box, so that a wide opening is made there between the vocal cords for the air to pass through. Inspiration then, is a muscular act, requiring effort, and the muscles which perform it must go on acting if we are to live. A person may lie in bed all his life, and may never even move himself in bed. The muscles of his neck and arms and legs and trunk may all lie unemployed for years, but there are at least two muscles which must be in action if any of us is to live; they are the heart and the diaphragm.

Expiration, or breathing out, is quite different. Except when we cough or sneeze, or speak or sing, or when there is some obstruction in the air-passages, expiration costs no effort at all, and no muscles are employed. What happens is simply elastic recoil—the recoil of the stretched lung and the recoil of the wall of the abdomen, which, as you know, bulges forward when we breathe. So, without any effort, the air is forced out of the lung, and a new breath is taken in.

THE SMALL SPOT IN THE BRAIN WHICH IS THE CENTRE OF OUR LIFE

The whole of this wonderful process is entirely governed by a small spot in the brain, which we call the breathing centre. It lies quite near the centres that govern the heart and blood-vessels. The old name which was given to this centre when it first was found was the *vital point*, because in a sense it is the centre of our life. If anything destroys it, we must die. Certain poisons act upon it, such as the poison in opium; too large a dose of either opium or alcohol kills in this way by paralysing the breathing centre. We know now how this wonderful centre works, and how it can modify our breathing. The nerve-cells that make it up are nourished by the blood, and they are very sensitive to the quality of the blood that reaches them. Especially are they sensitive to the presence of too much carbon dioxide in the blood. Nothing else excites them so much. Directly this happens they send powerful orders to the breathing muscles to breathe deeply and quickly, and get rid of the excess of this poison.

Now, since these nerve-cells act entirely in accord with the quality of the blood, there is a way of getting them to rest for a time, and this is known by everyone who performs diving feats. Boys often try to see how many plates they can pick off the floor of a swimming bath. Now, the way to stay under water as long as possible is to take a number of quick long, deep breaths for a little while just before you dive in. By this means you can get rid of a great deal of the carbon dioxide in your blood, and you can stay under water quite a long time, until at last so much fresh carbon dioxide has passed into your blood from the tissues that your breathing centre will rest no longer, and you *must* breathe.

WHAT TO DO WHEN YOU COUGH THE WRONG WAY

We have already read something about sneezing, which is a particular kind of expiration, in the BOOK OF WONDER, on page 814. Speaking, singing, and coughing are all special kinds of expiration, too. Hiccough, on the other hand, is a special kind of inspiration. If you notice yourself next time you hiccough, you will see that it is just the opposite of coughing. In coughing you breathe out, in hiccoughing you breathe in. Hiccough is due to something disturbing the diaphragm; usually something in the stomach. If it can be stopped at all, there is one way of doing so which is much better than any other. What you should do is to breathe out as far as you can, and hold your breath there until you feel bound to breathe in again. Doing this three or four times will stop the hiccoughing, if it is to be stopped at all, for it means that you are deliberately ordering your diaphragm not to contract, but are making it rest, and usually it will behave after you do this.

THE NEXT PART OF THIS IS ON PAGE 1803.

WHY DOES A SLATE PENCIL WRITE?

CONTINUED FROM 1502

THE kind of pencil that we use to write on slate writes simply because the slate is hard enough to rub it down when it is pressed. Paper is not hard enough to do this; if we press very hard we only tear the paper. We not only require hardness, but also a certain degree of roughness, to enable us to write. Neither an ordinary pencil nor a slate pencil will write on glass, because the glass is so smooth that there is not friction enough to rub off the tip of the pencil as we move it.

WHY WILL A PEN AND INK WRITE ON PAPER BETTER THAN ON A SLATE?

The principle of writing with a pen and ink is quite different from that of writing with a pencil, because here we are using a fluid, and what we want is a surface which will readily absorb a small quantity of the fluid as we write, but not too much of it; and writing-paper does this very well, though blotting-paper is too highly absorbent, and so does not allow us to write clearly. But a slate and a surface of glass are not absorbent at all, and, as a rule, the ink runs very slowly from the pen because there is nothing to draw it, and it is held by the pen almost as well as if we were just hanging the pen in the air. But paper, being absorbent, is full of tiny pores, and these draw the ink out of the pen in just the same way as a sponge will suck water.

WHY IS THE AIR ALWAYS SO HOT BEFORE THUNDER?

As a matter of fact, the air is not always hot before thunder, but it almost always has a way of *feeling* hot, and the whole point lies in the difference between these two things. We judge of the warmth of what is around us by the warmth of our skin, in which lie the sensitive ends of the nerves that tell us of heat and cold. And the reason why we always think it so hot before thunder is that our skins are so very apt to become hot at such times.

Before a thunderstorm the air is almost loaded with moisture. Now, this means, naturally enough, that it is very slow to take up any more moisture, and our skins, which are always producing water—for we perspire all the time, whether we notice it or not—find that they cannot get rid of it to the air as quickly as usual, and we say: "How muggy and close it is!"

Now, one of the great means by which the skin and the body are kept cool, though we are always producing so much heat in ourselves, is by the evaporation into the air of the water from our skins. If this process is slowed, the skin grows uncomfortably hot.

After the storm, when the water has mostly fallen out of the air, the atmosphere can readily hold what the skin desires to part with, and then we say: "How delightfully fresh it is!".

HOW CAN WE JUDGE DISTANCE?

Mainly we judge by experience. For instance, a square box, as seen by us, is made up of lines running at various angles. This is true when we look at it, and a picture of it simply copies the direction of these lines. If we did not know that that was what a square box looked like, we could not tell its shape. A small child, who has no experience, is quite unable to tell.

A very young child, just beginning to observe, cannot tell distance, either in a picture or in a real thing, because it has not yet learned that lines running in certain directions

mean this or that shape for the thing we are looking at. People who have been blind all their lives are similarly puzzled if their sight returns to them. It was long ago pointed out by observers of the mind that after the very beginning of our lives we never get a pure sensation of vision, whatever we look at, because we are always influenced by memory and experience, and so the eye contributes something of its own to what we see. Whenever we see distance in a picture or a real scene, the eye has made its contribution in this way.

How is it that we see distance in a picture?

A picture or a photograph gives us the effect of depth and distance, and what is called perspective, in exactly the same way as our eyes do in ordinary seeing. When we see anything, a photograph—that is, a light picture—is printed on the retina of the eye. It is printed on the flat, just as if it were on a photographic plate, yet we interpret this flat picture to mean something that has depth and distance.

If it is a picture we are looking at, *its* photograph on the retina is no flatter than it would be if we were looking at the real thing. Thus, in every case, the brain has to make sense, so to speak, of a flat photograph printed on the retina.

In some measure it does so by help of the fact that we have two eyes, seeing at slightly different angles. Thus one eye sees farther round one side of anything than the other does, and the other eye sees farther round the other side, and so we are helped to get the idea of depth.

When we look at an ordinary picture, however, we do not have this advantage, and yet we get the effect of distance just as we do when we look at a landscape with one eye only. So, plainly, having two eyes is not the whole explanation, or even most of it.

Why can we see so much out of one small window?

If we look at anyone's eye, we see in the middle of the colored part of it a small black spot, called the pupil. Now, there is no denying that this spot is a window, and a very tiny one indeed; yet through it a man can gaze upon a great part of the face of the boundless sky. Therefore this question about looking out of a small window might have been meant to refer to the pupil of the eye as well as to the window of a house.

Let us take the case of looking at the sky at night through a window; in any case it must be through the tiny window of the eye. In many directions we see the stars, and the distance between them is enormous. This can only mean that the rays of light travel straight from each star to the eye, and enter it from various directions at once.

So long as the rays do not come in too slantingly to strike the retina—the curtain at the back of the eye—we shall see the stars at once. Of course, the size of the pupil, or the window, makes a difference, for if it is small, many rays coming at a big angle will be cut off.

Why cannot we walk straight when we shut our eyes?

It is really not very surprizing that we cannot walk straight when we shut our eyes; it would be more surprizing if we could. There is only one way in which we could possibly walk straight with our eyes shut, and that would be if the strides taken by our two legs were always equal. In that case we could walk straight with our eyes shut.

But, though we may not think it, our strides are not the same length, and this is probably true of everyone, without exception. Our legs are, as a rule, very nearly the same length, but if we measure them very carefully, we shall find that they are never quite exactly the same length. So, in point of fact, everyone takes rather a longer stride with one leg than with the other, and so, if we are left to ourselves, without any guidance at all, we walk in more or less large circles.

But when we find we cannot walk straight, even for a few paces, with our eyes shut, the reason is not in our stride at all, but in the difficulty of balancing. Our eyes are of the greatest importance in helping us to balance our bodies, and without them the weight of our bodies is apt to go too far on one side or the other, and then we have to take a step accordingly to save ourselves from falling, and thus we lose the straightness of our course.

When we are looking at a rainbow, can other people see the other side?

This is a very natural question to ask, and, of course, the whole answer

to it depends on what a rainbow really is. If it is anything at all like what it appears to be, there is no reason why, when we are looking at one side of it, other people should not be looking at the other side—just as if it were, say, the arch of a railway bridge. But it is absolutely impossible that anyone can be seeing the other side of the rainbow that we see.

What we call the rainbow is made by the reflection of sunlight from drops of water in the sky. Therefore, to begin with, the rainbow can only appear to us on the opposite side of us to the sun. Anyone trying to look at the other side of the rainbow would be looking towards the sun, where, owing to the very nature of a rainbow, one can never be seen. Now, if a rainbow is formed by the reflection of light from drops of water suspended in the sky, that are so placed as to have our eyes between them and the sun, plainly there can be no other side to the rainbow.

WHY DO OUR VOICES SOUND HOLLOW IN AN EMPTY HALL?

We can almost guess the right answer to this question for ourselves if we begin by asking ourselves why we use the word "hollow" to express the sound of our voices in such a case as this. The truth is that this is the kind of sound that is produced within any hollow or more or less rounded space, and, by a rather absurd use of language, we call the kind of sound produced in a hollow space a hollow sound.

Now, we must ask what it is that gives this character to the sound. It is that the sound is reflected back from the sides of the space where it finds itself, and it is this echoed quality that distinguishes it.

Exactly the same thing makes the difference between our voices on the level in the open air and in an empty room or hall. The reason why furniture and people and hangings help so much to deaden the sound in a room is that these things either have very irregular surfaces, which break up the sound waves and do not reflect them truly, or else they are made of materials which are soft and not elastic, and therefore simply absorb the sound and deaden it.

WHY DOES MY VOICE SEEM LOUDER WHEN I PUT MY HANDS OVER MY EARS?

We can help ourselves to answer this question if we consider the case of a sea-shell held over the ear. There is no sound made in the shell, but it picks up all the tiny sounds that are made in the room, and echoes them to the ear. Our hands held over our ears act in exactly the same way. They echo the sounds just as the shell does.

But it is true that the special case where the voice is our own is rather different from other cases. Perhaps we are rather apt to think of sound as something that always flies "forward" from the place where it is made. But, just like the light of a candle, sound flies out equally in all directions, except in so far as special causes direct the waves or echo them.

So the sound made by our voices travels round beside our ears, and is caught and echoed into them by our hands. Not only do our voices sound louder, but they also sound very strange to us. This is because we usually hear our voices partly through the air waves coming against our ears, and partly by sound waves traveling through the head to the ears from the voice-box. Anything that alters the proportion of these two seems to change the voice.

WHY DO OUR HANDS BECOME WARM AFTER PLAYING WITH SNOW?

It is very wonderful that our hands should become warm after playing with snow, for it must be perfectly certain that the cold snow takes heat away very quickly from our warm hands.

The warmth of our hands is derived entirely from the blood, except at times when something hot is actually giving them heat. Therefore, for some reason or other, a very much larger amount of blood than usual must be flowing through our hands. The blood is no warmer in itself, or the whole of the body would at once notice it, but what really happens is that the hands are getting a much larger and quicker supply of it.

The effect is just the same, really, as the delightful glow that we feel after a sea-bath. The brain has the duty of taking care of the skin, as of every other part of the body. Now, when the skin has been chilled, its life has been heavily taxed, and it will suffer unless it is compensated. So the brain orders the small blood-vessels in the skin, wherever it has been chilled, to relax and widen so that the warm blood is able to circulate quickly through them.

ARE THERE MORE PEOPLE COMING INTO THE WORLD THAN GOING OUT OF IT?

Certainly there are. There were never so many human beings in the world as there are to-day, and there will be more to-morrow. Every new power that men learn how to use, every machine and invention, all new knowledge about plants and animals, and the forces of Nature, mean, in the long run, that we are making the earth a place capable of supporting more of us. No one knows how rapidly the population increases in China and many other parts of Asia; but in Europe the facts are fairly well known.

Every year there are nearly half a million more people in the British Isles than the year before. The Germans add two babies to their population for England's one. This reckoning is not made on the birth-rate, but on the difference between the birth-rate and death-rate, which is what this question asks about.

In France the birth-rate and death-rate, though varying to and fro in the last few years, are about equal; but in Russia, where families are the largest in Europe, the number of people increases every year to the extent of about two and a quarter millions.

In the United States the population increases very rapidly, for here it is increased not only by the fact that more babies are born than people die every year, but also because many people come over every year from Europe and, also, to an increasing extent, from Asia.

WILL THE WORLD'S FOOD SUPPLY EVER RUN SHORT?

It is quite plain and certain that, as people cannot live without enough food, there never will be more people than there is food for them to eat. But it is true, in a sense, that there is not enough food for all the babies that are born. The struggle for life is, in the first place, a struggle for food, and for a large number of people all over the world the struggle is so severe that many babies and children are killed by it, directly or indirectly.

But, as we read in the previous answer, the number of people in the world steadily increases, and doubtless always has increased since mankind came to be, except for short periods during some terrible war or pestilence. And steadily the amount of food has been increased by human effort. Men learnt how to tame and care for sheep and oxen and goats, and so obtained flesh and milk. This pastoral stage—pastoral comes from the word pastor, which means a shepherd—yielded to the agricultural stage of growing crops, which supports far more human life than the pastoral stage alone can.

It is certain that some day there must be a limit, though, even with sixteen hundred millions of people on the earth, we are nowhere near it yet. When freed from the insects that carry disease, Africa alone will be capable of holding and feeding five hundred million people more than it does now.

OF WHAT IS MIST MADE?

Mist is made of water, as anyone can tell who has been out in it and has felt it cling to his hair and his clothes. But there are many and various ways, besides mist, in which water is found in the air, and one of the very questions which men of science are now doing their best to answer is the question why the water in the air should sometimes form cloud, sometimes mist, sometimes rain, and sometimes be found entirely as water-vapor, quite invisible and simply forming one of the gases of the air.

We are now beginning to learn that, if water is to be in the air in any form except the last, it must have something to cling round. This is true of raindrops or mist or cloud. Probably the differences in these cases are due to variations in the kind of thing that the water clings to and condenses round.

Often these *nuclei*, as they are called, are particles of dust, large or small, but sometimes it seems that the very molecules of the other gases of the air are apt to get broken up by electrical power, and the broken parts of these molecules act as centres for the water-vapor to cling to and gather round.

HOW CAN THE EARTH REFLECT LIGHT WHEN ITS SURFACE IS DULL?

But is the surface of the earth dull? Surely not. The very fact that we can see it at all shows that it is reflecting light to our eyes, and very often the surface of the earth looks exceedingly bright; so also very often does the surface of the sea, and we all know how beautifully bright the lighted side of the clouds may appear.

THE NEXT QUESTIONS BEGIN ON PAGE 1787.

THE WORLD'S FLAGS IN COLOR

THE flags of the principal nations of the world are shown on another page in their proper colors, or almost their proper colors, for no ink is made which will represent exactly the colors in some of them. Since the beginning of the Great War some of these flags have become better known to us than formerly. Once it was unusual to see the flag of a foreign country displayed. Many nations have more than one flag. Generally there is a national or royal flag and often there are naval and trading flags for merchant ships in addition. For example, the Union Jack is the national flag of Great Britain, but the king has another flag, and the Navy uses a white flag which a great red cross divides into quarters, and the Union Jack fills one of these quarters. The German flag shown is the naval flag, while the merchant flag is simply the upper left hand corner without the cross. The Japanese flag shown is the naval flag, while the merchant flag shows only the red sun without rays on a white ground. There is an imperial flag besides.

THE FLAGS OF ALL NATIONS

CONTINUED FROM 1547

SOMEWHERE in his pockets a man carries a case containing cards bearing his name and address. If he wishes to be known, he presents one of his cards to the person whom he meets. That will make him known to anybody who can read. But years and years ago that card would not have served this purpose. Great lords and ladies could not read. They wanted signs, just as little children do to-day. When knights rode forth to battle, they wore cloaks over their armor, or carried pennons upon their lances, bearing their devices.

Nations are recognized by their flags just as the knights of old used to be. To carry a sign as a means of identification is a very old idea. The Israelites had their sacred standards: the Egyptians had their fan-like arrangement of feathers, borne on the top of spears, showing pictures of their gods and sacred animals. It was necessary that these signs should be borne, so that troops in battle would recognize the flag of their friends, and rally to it instead of fighting or running away.

When England first became a strong military power, her soldiers went forth to battle under many flags. Each great nobleman who kept a fighting force had his own standard, and there were as many battle-flags as noblemen in the armies, but in the time of Richard Cœur-de-Lion was the beginning of what is now the Royal Standard. It is known that he used the three lions for the national flag, for there exists his great seal with the three lions, like those of the flag, upon it. As time went on and the British kings conquered other peoples, or married queens from other royal families, signs were added to the flag. For a long time England laid claim to France. Her rulers called themselves kings of France as well as of England, and the national flag bore upon it the badge of France until 1801. There were also the arms of Hanover in the middle of the Standard. There were many changes in it before it took the present form.

Now the Royal Standard is divided into four quarters, and represents the arms of Great Britian and Ireland. In the first quarter are the three British lions of England. In the second quarter the angry-looking fighting lion of Scotland. In the third quarter the harp of Ireland, and in the fourth quarter the lions of England are repeated. Wales does not appear as a separate country on the flags. She is so much a part of England. The arms of Ireland were on the flag long before the union of Ireland with England, because Ireland had been conquered by England, but it was not until 1801 that the union between the two countries took place. The arms of Scotland were placed on the Royal Standard when James VI. of Scotland became

Copyright, 1908, by Amalgamated Press, Ltd.

James I. of England. The Royal Standard is really the king's flag. It can be flown only where he is living and at a few fortresses.

When the American colonies were subject to Great Britain they used the British flag. After they began to revolt a number of different flags were used in different colonies. One had a rattlesnake with the motto "Don't Tread on Me"; another much used had a pine tree.

Congress, in June 1777, decided upon a flag of thirteen stripes, seven red and six white, with thirteen white stars upon a blue ground, to indicate that the Union was composed of thirteen states. Some think the idea came from the coat of arms of the Washington family, which shows white and red stripes and stars. Mrs. Betsy Ross, of Philadelphia, is said to have made the first flag, and the first time one was used in battle was at Oriskany or Fort Stanwix, August 6 the same year.

When Vermont and Kentucky, the first two new states, were admitted to the Union, both stars and stripes were increased to fifteen, but when other states were admitted, it was seen that the stripes could not be increased. So the number of stripes was reduced to thirteen in honor of the thirteen colonies, but a star has been added for each new state. The number, since Arizona and New Mexico have been admitted, is forty-eight.

The German nation consisted, until 1870, of many kingdoms and other little states. Then the countries united and made the King of Prussia the German Emperor. They had then to create a national flag. In this, as in the German Imperial Standard, the Prussian eagle and colors of black and white figure largely. That is because Prussia is the largest and most important kingdom in Germany, and the black eagle has for 500 years been the emblem of the Hohenzollerns, the royal family of Prussia.

One flag of Austria-Hungary has a patch of green in the bottom corner. The reason is this : The Austrians are one nation, the Hungarians are another. One sovereign, the Emperor of Austria, rules both countries, but he is crowned a second time as King of Hungary. And to show that they are two countries, we have the colors of Austria and the patch of green for Hungary, declaring that the flags of the two nations have been placed together and made into one to represent the two peoples as one united nation. The Imperial Standard is shown here. The Russian Imperial Standard is a two-headed eagle upon a yellow ground. This comes from the arms of the Greek Empire, the Tsar Ivan III. marrying in 1472, a daughter of the ruler of the Greek Empire, and adopting her arms. Other Russian flags represent St. Andrew, who is said to have taken Christianity to Russia, and St. George.

France, like England, has the red, white and blue for her banner. In olden times she had the fleur-de-lys. What that really was we do not know. Some say it was a lily; others say it was an iris; while others believe that it was the head of a lance. It was no longer used after the people of France turned their king off the throne and had Napoleon for their emperor. He had the eagle for his war emblem, but the simple red, white and blue banner is to-day, as it has been for over a century, the national banner of France.

The Spanish Royal Standard tells stories. It bears the arms of countries which it no longer owns. It shows the arms of Austria, of parts of France, of Sicily, of Portugal, and of parts of Belgium. All these places were once owned by Spain, and she retains the colors in her flag as if they still were hers. The flag which has been longest unchanged is that of Denmark. The Danish king, 700 years ago, said he saw a cross in the sky when fighting against the heathen, and as he was victorious adopted the cross for his banner.

One of the youngest of important national flags is that of Italy. The might and majesty of Rome passed away, and the country became split up into little states, some ruled by the Pope, some by Austria, some by petty kings. Victor Emmanuel, aided by Garibaldi and other bold volunteers, rid the country of its enemies, and made the Italians one nation. He was made king, and gave the country the flag of united Italy.

Greece, which gave to mankind Alexander the Great, conqueror of the world, fell, in later days, under the rule of the Turks, who for 500 years held the country in bondage. In 1830 she gained her freedom. Her first independent king was from the royal house of Bavaria, and she adopted his colors.

THE NEXT FAMILIAR THINGS BEGIN ON 1765.

THE FLAGS THAT FLY IN THE FOUR WINDS OF HEAVEN

THE FAMILIAR FLAGS OF FIFTY NATIONS

THE FLAG OF CANADA

HAIL to the Great Dominion!
The home of the oak and pine,
Realm of the sunlit wheat-field,
Of the orchard, ranch and mine.
Niagara thunders praises
In sublime and endless key,
The northern waves applaud it
On the sand of the Hudson's Bay.

The wild Atlantic lauds her
On the coast of Labrador;
The broad Pacific answers
On the fair Vancouver shore.

Hail to the land of the Maple Leaf!
All hail to the Northern Queen!
Who wears the crown of the gleaming peak
And the robe of prairie green.

THE AMERICAN FLAG

WHEN Freedom, from her mountain height,
Unfurled her standard to the air,
She tore the azure robe of night,
And set the stars of glory there!
She mingled with its gorgeous dyes
The milky baldric of the skies,
And striped its pure celestial white
With streakings of the morning light,
Then, from his mansion in the sun,
She called her eagle-bearer down,
And gave into his mighty hand
The symbol of her chosen land.

Flag of the free heart's hope and home,
By angel hands to valor given!
Thy stars have lit the welkin dome,
And all thy hues were born in heaven!
And fixed as yonder orb divine,
That saw thy bannered blaze unfurled,
Shall thy proud stars resplendent shine,
The guard and glory of the world.
Forever float that standard sheet!
Where breathes the foe but falls before us?
With Freedom's soil beneath our feet,
And Freedom's banner streaming o'er us!

THE WAVERLEY NOVELS

IN these pages we read two more of Scott's famous stories: "Ivanhoe" and "The Antiquary." The first is a romance of the return of Richard Cœur de Lion, or Richard "the Lion-hearted." In "Ivanhoe" we are, for the first time in the Waverley Novels, entirely in England. "The Antiquary" is a story of life not far from Edinburgh, on the southern shores of the Firth of Forth, in the last ten years of the eighteenth century. In the character of the sturdy old Whig antiquary, Jonathan Oldbuck, is reflected some of the author's own characteristics; and we are told that the novel was his favorite. The figure of old Edie Ochiltree, the garrulous, kind-hearted, wandering beggar, or "gaberlunzie man," has always been a favorite with Scott's readers. A beggar in those days wore a sort of uniform and had a licence to beg. An antiquary, of course, means one who devotes himself to the study of records and relics of the past.

WHEN KNIGHTS WERE BOLD

BEING THE STIRRING TALE OF "IVANHOE"

CONTINUED FROM 1620

THE period of the story, to quote Scott's own words, is that when Richard's return "had become an event rather wished than hoped for by his despairing subjects, who were in the meantime subjected to every species of subordinate oppression. The nobles, whose power had become exorbitant during the reign of Stephen, and whom the prudence of Henry II. had scarce reduced in some degree of subjection to the Crown, had now resumed their ancient licence in its utmost extent."

The scene of the story is "in that pleasant district of merry England which is watered by the River Don," where "there extended in ancient times a large forest, covering the greater part of the beautiful hills and valleys which lie between Sheffield and the pleasant town of Doncaster."

The forest was that of Sherwood or Rotherwood, numerous remains of which are still to be seen, and many parts of which are named after Robin Hood.

In romantic Sherwood, in the days to which the novel refers, there dwelt a brave old Saxon named Cedric of Rotherwood. In his service were a jester named Wamba and a swineherd named Gurth. One evening, as the sun was setting upon one of the rich grassy glades of the forest, these two were surprized by a party of horsemen. The travelers included a monk, Prior Aymer of Jorvaulx, and a Norman knight, Sir Brian de Bois-Guilbert, commander of the Order of the Knights Templars. They were on their way to Ashby-de-la-Zouch, where a tournament was about to take place. They sought the way to Rotherwood, the residence of Cedric. Wamba, not liking their appearance, gave them directions which would have taken them to Sheffield. But at the cross-ways they found a palmer, or pilgrim, lying on the ground asleep. To settle the point whether they should turn to the right or the left, as to which the monk and the knight were divided in opinion, they awoke the sleeper, who conducted them to Cedric's mansion.

Cedric was no lover of the Normans, but he put hospitality before his other feelings, and opened his doors to the new-comers. When supper had been served in the great hall, the steward, suddenly raising his wand, said aloud;

"Forbear! Place for the Lady Rowena!"

A door was opened behind the banqueting-table, and the ward of Cedric, followed by four female attendants, entered.

"Formed in the best proportions of her sex, Rowena was tall in stature. Her complexion was exquisitely fair; her clear blue eyes seemed to command as well as to beseech. Her

profuse hair, of a color betwixt brown and flaxen, was braided with gems. She wore a garment of pale sea-green silk, over which was a loose, flowing robe of crimson wool. Round her neck hung a golden chain, and a veil of silk, interwoven with gold, was disposed about her head and shoulders."

AROUND THE HOSPITABLE BOARD OF CEDRIC THE SAXON

Cedric was endeavoring to draw the Templar's undesirable attentions away from his ward, when some disturbance was caused by the arrival of an old Jew, who called himself Isaac of York, and who pleaded for shelter for the night, as a storm had arisen. To the anger of the Normans, Cedric gave orders that the Jew should be given a seat at the lower end of the table. Here it would have gone hard with him but for the courtesy of the Palmer, who had entered with the Norman party, but whose face had remained hidden behind his cowl.

Wine having flown pretty freely, Sir Brian began to boast of the prowess of the Norman knights in the Holy Land.

"Were there none in the English army," asked the Lady Rowena, "whose names are worthy to be mentioned with the Knights of the Temple and of St. John?"

"Forgive me, lady," replied Bois-Guilbert. "The English monarch did, indeed, bring to Palestine a host of gallant warriors, second only to those whose breasts have been the unceasing bulwark of that blessed land."

"Second to none," said the Palmer, who had stood near enough to hear, and had listened to this conversation with marked impatience. It is impossible to describe the bitter scowl of rage which rendered yet darker the swarthy countenance of the Templar, as the Palmer repeated his statement, mentioning the names of Richard and of five others, and adding that the name of the sixth, "of lesser renown and lower rank," dwelt not in his memory.

SIR BRIAN TELLS OF IVANHOE'S DEEDS AND CHALLENGES HIM TO COMBAT

"Sir Palmer," said Sir Brian de Bois-Guilbert scornfully, "this assumed forgetfulness comes too late to serve your purpose. I will myself tell the name of the knight before whose lance fortune and my horse's fault occasioned my falling—it was the Knight of Ivanhoe. Nor was there one of the six that, for his years, had more renown in arms. Yet this will I say, and loudly, that were he in England, and durst repeat, in this week's tournament, the challenge of St. John-de-Acre, I, mounted and armed as I now am, would give him every advantage of weapons and abide the result."

"Your challenge would be soon answered," replied the Palmer, "were your antagonist near you. If Ivanhoe ever returns from Palestine, I will be his surety that he meet you." As he said this, the Palmer placed on the table a small ivory box containing a sacred relic. In reply, the Templar took from his neck a gold chain, exclaiming, "Let Prior Aymer hold my pledge and that of this nameless vagrant, in token that when the Knight of Ivanhoe comes within the four shores of Britain, he underlies the challenge of Brian de Bois-Guilbert, which, if he answer not, I will proclaim him as a coward on the walls of every Temple Court in Europe."

IVANHOE DEFEATS THE HAUGHTY TEMPLAR IN THE TOURNAMENT

The next morning, very early, the Palmer, who seemed to know exceedingly well the ways of Cedric's dwelling, made his way to the cell where the Jew slept, and bade him arise and escape, as the Templar had threatened to kidnap him. The Palmer offered himself to conduct Isaac to a place of safety. Whispering a word in the ear of Gurth, which greatly astonished that individual, the Palmer gained egress for himself and the Jew.

When the two had arrived at a spot beyond the domains of Bois-Guilbert's friends, Philip de Malvoisin and Reginald Front-de-Bœuf, the Jew astonished the Palmer by telling him that he had pierced his disguise—the Palmer was a knight—and induced him to accept a letter that would secure him the loan of horse and armor.

When the day arrived for the opening of the tournament at Ashby-de-la-Zouch, Sir Brian and his companions easily vanquished all those who entered the lists against them. Then, after a pause, a solitary trumpet announced the entry of another champion. It was none other than the knight who, disguised as a palmer, had caused the Templar so much annoyance in Cedric's banqueting hall. He entered the lists with his vizor down, and carrying a shield which

SCENES FROM THE TALE OF "IVANHOE"

In the time of Richard I., the Saxons had not quite forgiven the Normans for conquering them. But Cedric the Saxon was very hospitable, and even Norman knights were welcome to his table, at which his beautiful ward, the Lady Rowena, was always to be seen in the place of honor. Cedric is here leading Rowena into the banqueting-hall.

Cedric's son had been sent away because he had fallen in love with Rowena, whom Cedric meant to be the wife of another. One day a pilgrim came to Cedric's table, where some Norman knights were. A Jew also arrived, and as the Normans meant to harm him, at night the pilgrim whispered to one of Cedric's men, who helped the Jew to escape.

The pilgrim was Cedric's own son in disguise, and that was why the swineherd Gurth obeyed him. At the table the pilgrim had challenged a boasting Norman knight, Sir Brian, to meet in combat one named Ivanhoe. At the tournament the encounter took place, the Norman being overthrown by Ivanhoe.

The Lady Rowena awarded the wreath of victory to the knight of Ivanhoe, who, when his helmet was removed, was discovered to be none other than Cedric's son and her sweetheart. But the hero had many other adventures to face before he married the fair Rowena, as told in "Ivanhoe."

bore the legend "Disinherited." The Templar was overthrown, and this was the lot of his companions with the exception of one, whose horse, rearing at a critical moment, placed him at a disadvantage of which the Unknown Knight refused to avail himself, whereupon the Norman owned himself vanquished by courtesy.

On the second day, in a fight, the Unknown Knight was even more successful, though he would have fallen when engaged with Bois-Guilbert, had not a knight in black armor ridden up and felled Front-de-Bœuf, when the last-named was spurring to his friend's assistance. At the moment when the Unknown Knight, having removed his helmet, was receiving from the trembling hands of the Lady Rowena the chaplet of honor, he fainted. It was then found that he had been badly wounded. Cedric, rushing forward, then discovered, what his ward had discovered before him, that the knight was none other than his son, Wilfred, whom he had banished because of his love for the Lady Rowena.

THE MYSTERIOUS BLACK KNIGHT WHO CAME TO IVANHOE'S ASSISTANCE

Cedric dearly loved his son, but desired that his ward should marry another. The son of Cedric and Ivanhoe were one and the same. The Black Knight who had come so opportunely to Ivanhoe's aid in the lists was none other than Richard, the crusading King of England, whose younger brother, afterwards the bad King John, had tried to usurp his throne during Richard's absence in the East. Ivanhoe was carried from the field by friends, his father having conquered his first impulse to claim him.

While Cedric and his party were returning to Rotherwood they came upon Isaac and his daughter Rebecca. With these two was an ambulance containing an invalid, and they sought protection on their journey, as their men had taken flight and fled after hearing that a band of outlaws was lying in wait for the travelers in the forest. At Lady Rowena's intercession Cedric allowed the Jew to travel with him. Some time afterwards Cedric's party was attacked by a band of armed men, and taken prisoners, only Wamba escaping. The armed band was composed of the Templar and some of the followers of the usurper, John, who had been at the tournament. Wamba sought out Robin Hood, and this doughty outlaw, with the Black Knight, whose identity was as yet unknown to Robin Hood, laid siege to the Castle of Torquilstone, the fortress of Front-de-Bœuf, whither the captives had been taken. They arrived just in time to save the Jew from horrible torture, the Lady Rowena from the evil-hearted De Bracy, one of John's adherents, and Rebecca from an evil fate at the hands of Bois-Guilbert.

ROBIN HOOD JOINS THE BLACK KNIGHT IN THE SIEGE OF THE CASTLE

During the siege Rebecca found her way to the turret, where the wounded Ivanhoe lay, and induced Ulrica, an old woman with whom he had been left in charge, to hand over the charge to her.

The noise within the castle, occasioned by the defensive preparations, had now increased into tenfold bustle and clamor. Ivanhoe, impatient of his wounds, was all eagerness to see how the battle went.

"If I could but drag myself," he said, "to yonder window, that I might see how this brave game is like to go—if I had but bow to shoot a shaft, or battle-axe to strike were it but a single blow for our deliverance! It is in vain! It is in vain! I am alike nerveless and weaponless!"

"Thou wilt but injure thyself by the attempt, noble knight," replied his attendant. "I myself will stand at the lattice, and describe to you as I can what passes without."

"You must not—you shall not!" exclaimed Ivanhoe. "Each lattice, each aperture, will be soon a mark for the archers; some random shaft——"

"It shall be welcome," murmured Rebecca, as with firm pace she ascended two or three steps, which led to the window of which they spoke.

THE BRAVERY AND FORTITUDE OF REBECCA, THE BEAUTIFUL JEWESS

In spite of Ivanhoe's appeals, this brave maiden (who had come to love the knight) took an ancient shield for protection, and kept him acquainted with the tide of battle. When he heard of the Black Knight's prowess, Ivanhoe was at no loss to understand who it was that was so valorously coming to their aid. By the assistance of Ulrica, who, as an act of vengeance against Front-de-

Bœuf, had set fire to the castle, the besiegers were successful; and it was in the arms of the Black Knight that Ivanhoe was carried out of the burning building.

But Rebecca was found by the Templar, and carried off by him to withstand a trial for witchcraft. Her fearlessness at length conquered the base heart of Bois-Guilbert, who begged and was given her forgiveness. He even meditated flight, but was induced by a wily counselor to maintain his position at the Castle of Templestowe, where it was arranged that Rebecca should be burnt, unless a champion should appear on her behalf against him. At the last moment a champion appeared. It was Wilfred of Ivanhoe.

When the Templar saw him, he said:

"I will not fight with thee at present. Get thy wounds healed, purvey thee a better horse"—Ivanhoe's horse was exhausted with many miles of travel—"and it may be I will hold it worth my while to scourge out of thee this boyish spirit of bravado."

But Ivanhoe insisted, and his knighthood supported his claim, though Rebecca pleaded that he should not "perish alone."

In the result Ivanhoe, weak as he was with illness, went down before the well-aimed lance and vigorous steed of the Templar. But Bois-Guilbert also went down, though hardly touched, in comparison, by Ivanhoe's lance. "He had died a victim to the violence of his own contending passions." His death was pronounced "the judgment of God."

Rebecca was pronounced free and guiltless. At this moment Richard, with a goodly company, galloped on the scene. He had himself meant to champion the Jewess. He dissolved the Temple Chapter which had tried Rebecca. Once more in power, the King, having reconciled father and son, attended the marriage of Ivanhoe and the Lady Rowena in York Minster. Rebecca and her father soon after left England for Grenada, there to dwell in peace.

THE LOST HEIR OF GLENALLAN

OR THE STRANGE STORY OF "THE ANTIQUARY"

ONE day in the eighteenth century two travelers between Edinburgh and Queensberry, delayed by the tardiness of the diligence or coach, lost the tide, and stopped for a snack at the Hawes Inn. One was a young man, of genteel appearance, named Lovel. He had been a soldier. The other was a good-looking man of about sixty, whose hale complexion and firm step announced that years had not impaired his strength or health. His name was Jonathan Oldbuck (or Oldenbuck), of Monkbarns, one of a family that had been established for several generations in the vicinity of the thriving seaport town of Fairport (supposed to be Arbroath).

Jonathan had no taste for commerce, and had experienced an equal distaste for the law when he succeeded to the estate. His instructor had said of him that "he never pays away a shilling without looking anxiously after the change, makes his sixpence go farther than another lad's half-crown, and will ponder over an old black-letter copy of the Acts of Parliament for days, rather than go to the golf or the change-house; and yet he will not bestow one of these days on a little business of routine, that would put twenty shillings in his pocket—a strange mixture of frugality and industry, and negligent indolence. I don't know what to make of him."

Mr. Oldbuck's manner at once interested and oppressed his fellow-traveler. Mr. Lovel, indeed, thought the old gentleman assumed an air of superiority that went beyond what the difference of age warranted. Both had their destination at Fairport, and though it was agreed that Mr. Lovel should call upon Mr. Oldbuck, the younger man delayed his visit till his baggage arrived, and he could present himself in a dress such as he thought corresponded with the rank in society he felt himself entitled to hold. It was not long before Mr. Oldbuck introduced his visitor to his "den" or retreat, where were amassed in extraordinary confusion all his antiquarian treasures. The laird was describing to his visitor the evidences of an old Roman encampment near his dwelling, when they were surprized by

the sudden appearance of a man who, having heard what Mr. Oldbuck had said, gave a very different description of what the antiquary had called the central point, or "pretorium" of the "camp."

EDIE OCHILTREE OF THE BLUE-GOWN, OR THE LICENSED BEGGAR

The new-comer—by name Edie Ochiltree—had the exterior appearance of a mendicant. A slouched hat of huge dimensions; a long white beard which mingled with his grizzled hair; an aged but strongly marked and expressive countenance, hardened by climate and exposure to a bright brick-dust complexion; a long blue gown, with a pewter badge on the right arm; two or three wallets or bags, slung across his shoulder, for holding the different kinds of meal, when he received his charity in kind from those who were but a degree richer than himself—all these marked at once a beggar by profession, and one of that privileged class of men who are called in Scotland the King's Bedesmen, or vulgarly, Blue-Gowns.

Not only did this individual cause confusion to Mr. Oldbuck. He suggested to Mr. Lovel that he knew enough of his movements to cause the young man to be very liberal in the way of alms-giving. Mr. Oldbuck, it should be remarked, had arrived at the conclusion that his young friend was an actor. Mr. Oldbuck was considerably exercized in his mind by Mr. Lovel's reticence about his own affairs. And this feeling spread to the Sheriff of Fairport, who had heard a rumor that, because Lovel went on lonely walks, and made free use of his pencil, he was a French spy.

HOW THE HERO OF THE STORY WAS MISTAKEN FOR A FRENCH SPY

Fears of a French invasion were pretty general at this period, but apparently Mr. Lovel entirely removed the worthy magistrate's suspicions, though the sheriff kept the explanations, whatever they were, to himself.

There was a rivalry of a kind between Mr. Oldbuck and his neighbor, Sir Arthur Wardour, an impecunious and somewhat foolish Tory, who had also acquired a taste for antiquities. His daughter Isabel, and a son, now absent on foreign and military service, formed Sir Arthur's whole surviving family. With Jonathan Oldbuck lived his sister, Griselda, and his niece, Mary MacIntyre. Invited to dinner at Monkbarns, Lovel made the acquaintance of these personages, except the baronet's son, soon after his arrival at Fairport. A heated discussion sent the guests home rather hurriedly, and the host was alarmed to learn that Sir Arthur and Miss Wardour had proceeded by way of the sands. This route had been taken by the baronet and his daughter when they found that Lovel was ahead of them on the turnpike road which led to Knockwinnock.

As Sir Arthur and Miss Wardour paced along, enjoying the pleasant footing afforded by the cool, moist, hard sand, Miss Wardour could not help observing that the last tide had risen considerably above the usual watermark. There was a sudden change in the weather. Then they saw the figure of Edie Ochiltree advancing through the haze to meet them. The mendicant told them their only chance of safety was to retrace their steps.

HOW LOVEL HELPED TO RESCUE HIS SWEETHEART AND HER FATHER

Despite all that Ochiltree could do, they were in despair, when Lovel was seen coming down the crags to the rocks on which they had found temporary foothold. By Lovel's help the baronet and his daughter were enabled to reach to a high rock. The rescue was finally effected by a party of fishermen got together by Oldbuck, who, when Sir Arthur and Miss Wardour were safely in their carriage, took Lovel home with him for the night.

The next day Oldbuck and Lovel went to call upon Sir Arthur and Miss Wardour at Knockwinnock Castle. Lovel and Miss Wardour had met before; indeed, Lovel entertained a tender regard for the baronet's daughter; and she, in her turn, was troubled at the thought that the circumstances of the previous evening had made her and her father so much the young man's debtors; also by the fact that Ochiltree had before this seen them both together. Miss Wardour bade Lovel dismiss his unfortunate attachment from his mind, leave a country that afforded no scope for his talents, and resume the profession

he seemed to have abandoned. His plea was that she should "have patience with him one little month, and if, in the course of that space, he could not show such reasons for continuing his residence at Fairport as even she should approve of, he would bid adieu to its vicinity, and, with the same breath, to all his hopes of happiness."

A GERMAN ADVENTURER TELLS STRANGE STORIES OF HIDDEN TREASURE

We learn next that Lovel was thought to be the son of a man of fortune, but there was some mystery about his birth, and that Miss Wardour, who had first met him at her aunt's house in Yorkshire, did not, when she saw him at Mr. Oldbuck's choose to renew his acquaintance till she should know that her father approved of her holding any intercourse with him.

Another significant fact disclosed at this juncture in the story is that Sir Arthur Wardour was greatly in need of money, and was basing hopes of fortune upon certain discoveries of one Dousterswivel, a German adventurer who obtained money from him under the promise of finding hidden wealth by a divining rod. Dousterswivel had come to both the baronet and Mr. Oldbuck with strange tales of appearances of old shafts and vestiges of mining operations. Mr. Oldbuck was misled to a small extent by some idea that the Phœnicians had in former times wrought copper in the spot Dousterswivel pointed out, but Sir Arthur had risked ruin in the enterprize.

THE HERO IS WRONGLY SUSPECTED OF BEING AN ADVENTURER

Invited with Oldbuck to join a small party at the ruins of St. Ruth's Priory, and afterwards to dine and spend the evening at Knockwinnock Castle, Lovel met Captain Hector MacIntyre, the nephew of the antiquary, and at the outset a distinct coolness arose between these two, the new-comer paying marked attention to Miss Wardour. The captain, with some haughtiness, questioned his sister Mary about the antecedents of his uncle's new friend. He followed this up directly by questioning Lovel about the latter's regiment, and showed very plainly his doubt as to Lovel's replies, stating that he had no recollection of his name, though he knew the regiment referred to and the names of the officers.

Dissatisfied with Lovel's replies to his questions, the Hotspur-like Captain MacIntyre suggests to him that his further visits to Monkbarns "must be dropped as disagreeable to him." Lovel's reply to the captain's emissary was that he should certainly visit Mr. Oldbuck when it suited him. The rejoinder to this was a request from the captain that "unless Mr. Lovel wished to be announced as a very dubious character he would favor the captain with a meeting in the ruins of St. Ruth." Lovel agreed to the meeting—with pistols—and secured a companion in an honest sailor, Lieutenant Taffril, whom he persuaded that, situated as he was, he could not discuss the subject of his family with any propriety.

HOW LOVEL FOUGHT A DUEL WITH THE ANTIQUARY'S NEPHEW

The meeting took place, despite the presence of Ochiltree, who did his best to prevent it. MacIntyre fell, begged Lovel's forgiveness, and bade him seek safety in flight, and this appeal being seconded by the mendicant, Lovel unwillingly allowed Ochiltree to lead him away into the recesses of the wood. At midnight, in the ruins, Ochiltree and Lovel witnessed an attempt by Dousterswivel to delude Sir Arthur with a bogus discovery of buried treasure and an equally bogus display of magic. The mendicant succeeded in giving the German a terrible fright, and in arousing the suspicions of the baronet on the score of Dousterswivel's honesty. Lovel next made his way to the seashore, and then on board Lieutenant Taffril's brig.

Meanwhile, Captain MacIntyre was being nursed at his uncle's house whither Sir Arthur came for the double purpose of raising another loan and of acquainting Mr. Oldbuck with Dousterswivel's "find" of gold and silver coins in the ruins of St. Ruth. Sir Arthur was accompanied by Dousterswivel, and Mr. Oldbuck stipulating that all should visit the ruins together and seek by digging what could be found, the party set forth with picks and shovels. They were met by Ochiltree, who promptly recognized the horn in which the coins had been "discovered" as an old snuff-

box that had once belonged to him. The workmen, on the mendicant's advice, dug in a certain place. A chest of silver treasure was disclosed. When Sir Arthur and Mr. Oldbuck had gone away, the German was induced by the mendicant to meet him again for the purpose of unearthing further treasure. The old mendicant, who was also an old soldier, led the treasure-finder a sad dance. Dousterswivel had another awful fright, on awaking from which his senses were further tried by witnessing the midnight funeral of the Countess of Glenallan.

With the advent of the name of Glenallan into the story, the reader becomes acquainted with a romance in the early life of Mr. Oldbuck, and with the secret of Mr. Lovel's birth. The old countess had been very jealous of her position, and fearing that her eldest son, Lord Geraldin, would marry a Miss Neville, who, for family reasons, had been treated as her husband's daughter, she suggested to the son that this relationship was a true one. But before she had approached him with this story his marriage to Miss Nevillle had taken place secretly. The young wife had died tragically after giving birth to a son, and the remainder of the days of her husband had been spent in sorrow and remorse. As for the son, he had disappeared, and no clue to his whereabouts had been discovered.

Mr. Oldbuck, who had been a suitor for Miss Neville's hand, had done all he could to shield her name from blame, and had become convinced that Lord Geraldin was a villain. It was only after his mother's death that Lord Geraldin learned from old Elspeth, the countess's former servant, the truth of the deception that had been practised upon him. In the meantime twenty years had passed by. The new Earl of Glenallan sought and secured the interest and help of Mr. Oldbuck in discovering his child.

EDIE OCHILTREE, THE BEGGAR

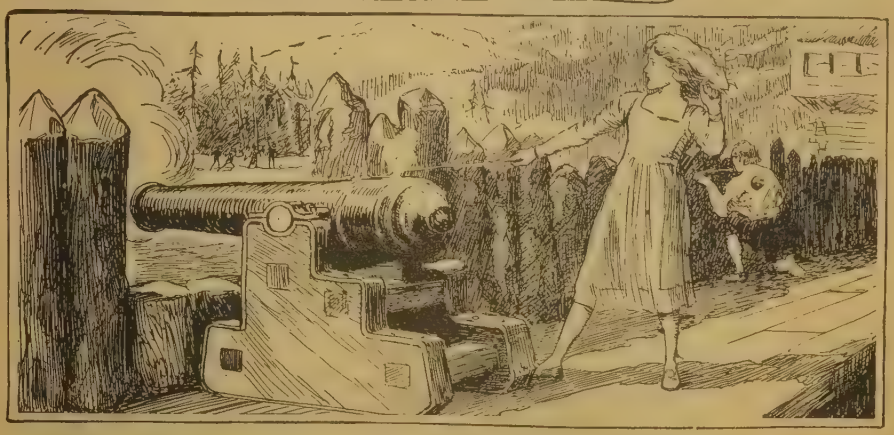
This picture of the strange character who plays so prominent a part in "The Antiquary" shows how a licensed mendicant looked in Scotland less than two centuries ago. He wore a blue cloak and a badge, and carried a bag, into which he put the meals that were given him. Begging was then a regular trade.

By this time the bailiff had come to Knockwinnock Castle. But his arrival was speedily followed by a message from Sir Arthur's son, who, by the aid of a friend, was able to enclose enough money to release his father from a very humiliating situation.

The friend was none other than Lovel, by whose directions the treasure unearthed at the ruins had been placed there, in order that Sir Arthur might be benefited without knowing at whose hands. To Sir Arthur's son Lovel was known as Major Neville, a distinguished officer in the King's service. It remains to be stated that Major Neville, who had been educated at the expense of Lord Glenallan's brother, and left his heir, was in reality the son of the earl. The restoration of the son to the father was followed by the marriage of the former to Miss Wardour.

Thus the tale of true love, though it had not run smoothly, ended in happiness, to the great joy of old Edie Ochiltree, whose satisfaction was all the greater because of Dousterswivel having been effectively unmasked.

THE NEXT STORIES OF FAMOUS BOOKS BEGIN ON PAGE 1773.



THE GIRL WHO HELD THE FORT

CONTINUED FROM 1331

MANY of us have heard or read of the dangers and hardships that our ancestors had to face as they tried to make a home or hold a settlement in this new country, then only a wilderness. Hunger and loneliness, hard toil and anxious waiting were among the least of their ills. Danger from Indians or wild beasts was an ever-present trouble. The same is true of the early French settlers in Canada.

Over two hundred years ago a log fort stood on the St. Lawrence River about twenty miles from Montreal. The land near the fort was cleared so that there should be no cover for attacking enemies and the open space served as pasture land for the cattle, and fields for the garrison. Around the fort itself was built a strong palisade made from the trunks of trees, stuck upright in the ground, and set so closely together that not even a bullet could penetrate the wall. In front of the fort and joined to it by a covered alley was a blockhouse where guns and ammunition were kept.

The commander of the fort was M. de Verchères. His family consisted of his wife, his two little sons of ten and twelve, and his daughter Madeline, a girl of fourteen. The fort was not heavily garrisoned for distances were great, and there were but few soldiers in those early days. M. de Verchères' company consisted only of twenty men who with their wives and families lived within the palisade. Besides keeping the defences in order, and occasionally making exploring or relief expeditions, the soldiers had to cultivate the fields, obtain fish from the river and game from the forest, to support the settlement. In harvest time nearly every one left the fort to work in the fields, for in the long hard winters food was very scarce, and often the boats from France failed to arrive.

It happened one day in harvest time that M. de Verchères, and all the soldiers, except two on guard at the fort, were out in the fields. Though he appeared quite calm the commander was uneasy and anxious on that beautiful day. Everything around seemed peaceful enough. The forest shone gorgeous in scarlet, green, and gold, and the river rippled lazily in the warm air. But a fur trapper going north had stopped at the fort the night before and had spoken around the watch-fire of a rumor that the Iroquois were on the war path. The man's words had been vague and it was unlikely that the Indians would dare to come so near to Montreal. Nevertheless, M. de Verchères' thoughts dwelt on the dark possibility and he made up his mind to hurry the harvesting, that he might keep watch within the fort.

Copyright, 1918, by M. Perry Mills.

He had hardly formed this determination when a scream pierced the summer stillness. One of the soldiers sprang high in the air and fell transfixed by an arrow. "The Iroquois! To the fort!" shouted M. de Verchères, but it was too late. In a long line that swiftly formed itself into a circle, the yelling savages enveloped the harvesters. The unequal fight was soon over, the Frenchmen quickly overcome, and the thirsting savages turned towards the forest to take counsel before they attacked the fort.

Madeline had been standing by the river when she heard her father's cry. She alone of all the harvesters had time to obey and she alone escaped. Besides herself there remained in the fort only the two soldiers, who had been on guard duty, an old man of eighty, some women and children, and Madeline's two brothers.

At the first sign of danger, the soldiers fled to hiding. As the Indians delayed their attack, Madeline went round to inspect the defences. She ordered the gaps in the stockade to be filled in and then ran down the covered alleyway to the blockhouse to look at the ammunition. There she found the two soldiers preparing to set light to the gunpowder and blow up the fort, rather than risk falling into the hands of the Indians. Her courage shamed them and they set themselves to defend the place. They and Madeline's two little brothers, who had been taught to shoot, opened fire from the loopholes.

"Crack! Crack! Crack!" the muskets rang out in quick succession. Through a loophole they could see the astonished savages scurrying back to the cover of the woods. Three forms lay still on the ground.

"The cannon," cried Madeline, and when it was loaded she fired it as a signal of distress. It frightened the savages, for they did not know that it was an appeal for help, which would be repeated from post to post till it reached the city of Montreal. How long would it be till help came? Could they deceive the Indians until that hour?

Hour after hour passed and there was not a sign of the Indians in the woodland beyond. All kept anxious watch, and once Madeline thought she saw the leaves of a low bush part and a coppery face look out; but she was not certain.

Late in the afternoon the watchers in the fort saw a canoe coming around the bend of the river.

"Here come La Fontaine, the settler down the river, and his family," cried one of the children.

Madeline frowned anxiously.

"We can't let them be killed," she said. She clutched her gun. "I will go out and meet them."

Slipping through the gate, she marched boldly, her musket on her shoulder, down to the wharf. There was no sign of movement on the edge of the forest. The Indians evidently believed that she was trying to lead them into some kind of ambush.

"Welcome, M. de la Fontaine," said Madeline. "The Iroquois are in the wood! March up behind me to the fort and do not hurry."

The little procession reached the stockade in safety.

Night came on, and had the Indians attacked them in the darkness, all would have been lost. Madeline ordered her elder brother and the soldiers to guard the women and children in the blockhouse, while she posted her young brother, the old man and herself as sentinels. All night long the sentries posted around the palisade cried at intervals "All's well!" and the man in charge of the blockhouse answered "All's well!" In this way they led the Iroquois to believe that there was a strong force in command of the fort and no attack was attempted. Once during the night Madeline's quick ears caught a soft sound of rubbing against the gates, and her heart beat faster.

"It sounds like the cattle come in from the field, Ma'm'selle," whispered old Gaston, who in his time had been a cowherd.

"I don't know," said Madeline doubtfully, "the Indians are full of tricks. They may be trying to fire the stockade. They might even be among the cows hidden in skins. Stay where you are. I will find out."

She crept around to the gate, and, opening it a little way, slipped out her hand. A cool, moist nose nuzzled into her palm. Reassured, she opened the gate a little wider, so that one cow at a time could slip in. "Bossy, bossy," she called softly, and the big animals lurched eagerly through the opening. As they passed her, she touched the

moist nose of each one with her hand to satisfy herself that there were no Indians hidden among them. They entered quietly, the soft pad-pad of their hoofs not distinguishable from the lapping of the waves, and noiselessly she closed and barred the gate behind them.

Day after day went by, until a whole week had passed. The Indians could now and then be seen watching the fort, but the place seemed too well guarded to attack, and they dared not venture out in the open to reconnoitre more closely. Big Eagle had done this on the second day, and that night Big Eagle's body had to be drawn back under cover of dark. So they watched and waited. The time seemed endless in the fort. All day and all night for seven horrible, anxious days, the watchers never left their posts. They snatched a little food as they stood at their posts, but as they ate it seemed to choke them.

On the seventh day, when they felt as though their powers of endurance could hold out no longer, help came. It was night when the succor arrived. Madeline sat in the living-room of the fort, her head on the table, fast asleep. Her gun lay across her arms. One of the sentinels called her.

"Ma'm'selle," he said, "I hear a noise down at the landing. Frenchmen or Indians are moving up the river."

"Which is it?" cried Madeline, springing to her feet, and hurrying out to the stockade.

Just then a loud knocking broke through the night sounds of the wilderness.

"Who goes there?" cried the sentinel.

"Who goes there?" cried Madeline.

"Frenchmen," was the response. "We bring you help."

Quickly the household gathered around and opened the gates. A young lieutenant marched in at the head of his company of soldiers. The relief was accomplished; the Indians had fled. The watchers in the fort could now rest secure. Madeline stepped forward, musket in hand, head high.

"Monsieur," she said formally, "I deliver the fort into your care. You have not arrived a moment too soon. My men are all worn out."

Then suddenly the strain of those awful seven days was too much for her. She forgot that she had been the stern commander of a garrison, and remembered only that she was a little girl and very tired. With a weary movement, she put her head down in her hands, and began to cry. The lieutenant lifted her up in his arms and carried her into the house.

"You poor, brave, wonderful little girl!" he said. "It is time for you to go to bed."

That night M. de la Monnerie discovered traces of the Indians back in the forest and he decided to surprise them.

Accordingly, as the cold gray dawn broke over the river and forest the soldiers issued from the fort at a run, firing and reloading to fire again as they advanced. The Indians were not prepared, for they had planned to begin the attack and, believing that they had no chance they hurriedly retreated, carrying off with them about twenty prisoners. The little French force could not follow them into the wilderness, but shortly after their departure a band of friendly Indians visited the fort, and learning of the attack, hastened after the retreating foe and surprised them on the shores of Lake Champlain.

In the battle that followed many of the Iroquois were slain and the rest put to flight. The French prisoners were recovered and restored by the friendly Indians to their own people, who had given up all hopes of ever seeing them again.

The news of Madeline's bravery spread far and wide through Canada, for M. de la Monnerie wrote an elaborate report of it to the Governor of Montreal. The Viceroy himself wrote her a letter and her heroism was rewarded by a pension. She grew into a brave woman, and later, had yet another adventure with the Iroquois, for her father's seigniory was directly in the way of the Iroquois when they marched against the settlers, and for that reason the fort was called Castle Dangerous. This time Madeline, rifle in hand, saved the life of Monsieur de la Perade, and later she married the man whom she had so gallantly rescued.

In Canadian History she is still remembered as the Heroine of Castle Dangerous. In the wigwams of the Iroquois, the squaws tell the little Indian boys of the white maiden, who with an army of three men, had kept the fort for seven days against the whole tribe.

THE NEXT GOLDEN DEEDS ARE ON PAGE 1742.

SIR ISAAC NEWTON STUDYING SUNLIGHT

This picture shows Sir Isaac Newton, the great scientist, experimenting with light. When in a garden he saw an apple fall to the ground, and this set him wondering why it fell to the earth and not into the sky. This led to his discovery of the great law of gravitation, by which we can explain the movements of the earth and the other planets, and to many other wonderful discoveries concerning the laws of Nature.

MEN WHO MAPPED THE SKIES

CONTINUED FROM 1620

PEOPLE often make fun of "star-gazers," but they would be very badly off if it were not for the star-gazers. Our great Navy would be practically useless. Without the help of the astronomers we could not steer at night, or out to sea. Our trains would run greater risks than they now do when traveling at night. Our almanacs would soon be out of date and useless. All would be chance and risk, for we should have no time-keepers, no guides.

Astronomy is the science which tells us all that is known about the heavenly bodies, and astronomers are the men learned in the science. We depend upon that science and upon the men learned in it for the government of our everyday life. It is probably the oldest science of all. It is certainly one of the most wonderful, and has the strangest, most interesting history.

The first astronomers were the ancient shepherds who watched their flocks by night in the fields, and gazed up into the brilliant skies, wondering what all the bright stars meant. Ignorant as they were, they made guesses at the meaning of the stars. We do not know who began the study. We know that the Chaldeans and the Egyptians were among the first; but India and China claim to have begun the study of the skies three thousand years before the Wise Men of the East followed the bright star to where Jesus was born in Bethlehem.

No doubt the Chinese astronomers would have been glad if their sovereigns had not been so interested in astronomy. For the men who studied the skies had to prophesy the date when an eclipse of the sun would take place, so that the people might get ready with gongs, and drums, and make noises, to frighten away the monster who, they believed, appeared in the sky to swallow the sun. If the astronomers failed to prophesy correctly, they were killed.

This shows us that the Chinese understanding of astronomy was not very clear; nobody's was in those early days. The first man to make an intelligent study of it was Thales, one of the Seven Wise Men of Greece. He was born in the year 640 B.C. and died in 546, and he gave all his life to the examination of the problems of Nature. He was the first to see that the sun and moon and stars were something more than signals placed in the sky

to mark the operations of demons and gods, and he was the first to draw maps showing the position of the most noticeable stars in the heavens.

About 400 years passed away before another great thinker took up astronomy. This was Hipparchus, a Greek scholar, who was doing his work about 150 years before the birth of Christ.

HIPPARCHUS, THE GREATEST OF ALL THE ANCIENT ASTRONOMERS

Hipparchus made a close study of the heavens, and was able, in a rough-and-ready way, to predict what would happen in the skies. This was different from the prophesying of the magicians, of whom the Bible tells us. Theirs was fraud and guess-work. Hipparchus prophesied because he had scientific knowledge. Moreover, he first brought astronomy to the assistance of geography, and made maps of the heavens, and of so much of the earth as was then known.

This does not seem much to us to-day, but it was really wonderful so long ago, when very little was known of science, and when there were no scientific instruments for measurements. Hipparchus found out that the year as counted by the sun was shorter than the year counted by the stars. This he learned by making measurements and comparing them with measurements taken 150 years earlier by Timocharis, another diligent student of the heavens. Hipparchus was the greatest of all the ancient astronomers, for his observations enabled him to write with skill about the sun and moon and the planets, and to fix the time of their movements with accuracy. Had another such man soon arisen, astronomy would before long have become a great science.

HOW PTOLEMY LED THE WORLD ASTRAY FOR THIRTEEN HUNDRED YEARS

But nearly 300 years went by before another famous star-gazer arose, and he did, perhaps, more harm than good. This was Ptolemy Claudius, an Egyptian mathematician, who lived in the second century after Christ. He carefully studied the works of Hipparchus, though nobody else seems to have preserved a copy. In addition to this study he did independent work. He discovered important changes in the course of the moon, and he discovered that light, coming from a distant star, on entering a thicker atmosphere, is refracted—that is, turned aside from the path which it was pursuing. So far so good.

The mischief that Ptolemy did was to declare that the earth exists as a fixed body in the midst of the universe, and that the heavens revolve round it once every twenty-four hours. For the next thirteen hundred years all the civilized world believed his theory to be true. People believed, during all that time, that the sky was a great solid vault, turning round on a mighty axis which fitted into fixed sockets, and that the stars were attached to the surface of the vault, by nails, or other wonderful fastenings.

Not the whole of this belief lasted up to the time of Copernicus, but the Ptolemaic system did. After the Greeks, the Arabs took up astronomy. They found the works of Ptolemy, seven hundred years after his death, and never questioned the theory. They worked on in the belief that all was as Ptolemy had said, and their own observations were added to the store of known facts; but they never came any nearer to the real truth than Ptolemy himself had done long before.

COPERNICUS, WHO SAT IN A TOWER AND WATCHED THE STARS

The modern history of astronomy dawned with Nicholas Copernicus, who was born in Poland in 1473, and died in 1543. His father, who was a trader, died while Nicholas was still a child. Happily his mother's brother, who was a priest and afterward became a bishop, undertook his education, and later sent him to the University of Cracow. Here he studied for the priesthood and also mathematics. Afterward he went to Bologna, where he learned astronomy as well as church law, and a few years later he went to Padua to study medicine.

Copernicus, as soon as he could, settled down as a canon at his uncle's cathedral, and devoted his days to relieving the sick and suffering, to preaching, and to the study of astronomy. He read all that he could of the old writers on astronomy, and his clear mind saw that there was something wrong in the conclusions which Ptolemy had reached. Night after night he would sit up in a tower and watch the silent stars, pondering on their mystery. He saw that the sun does not go round

the earth, but that the earth and the other planets go round the sun. But it was terrible to think such a thing in those days. All people held that God had made our earth the centre of the universe, that ours was the greatest and most important planet in the universe, and that all the heavens obediently attended, meekly whirling round and round us. If it were believed that the earth was not the centre of the universe, then some pious men said the importance of the earth disappeared, except for the fact that it was the home of man. These people did not see that the fact of man, God's highest creation, living upon the earth gave the earth a crowning glory such as, perhaps, no other planet possesses. They had agreed that the earth was the centre of the universe, and it was held that only the sinful would dare dream anything else.

Copernicus wrote a book to prove his new theory. In many ways it was faulty, but it contained great and wonderful truths, and was the foundation of modern astronomy. He knew the danger he ran, and he feared to give his book to the world. For years he kept it by him. He was drawing near to death when he at last ventured, and he received the first printed copy of his work on the very day that he died.

THE GREAT BOOK THAT COPERNICUS PRINTED ON THE DAY HE DIED

The book at first reached the hands of only a few educated people, so the Church did not much mind, and nothing was done concerning it for seventy years. Then the Church forbade people to read it.

Here we must say a word for the first Englishman interested in astronomy. This was Robert Recorde, who was born at Tenby, in Wales, in 1510, and died in 1558 in a London prison, where they sent poor men who owed money. He taught mathematics and medicine at Oxford, but settled down in London, where he had the opportunity to make much money; but he seems to have been careless, so that he became imprisoned for debt.

He was, as far as we know, the first man in England to agree with the new views put forward by Copernicus, and he was the first Englishman ever to write on astronomy in English.

Now we cross again to the Continent, to make the acquaintance of a famous Dane, named Tycho Brahe, who was born at Knudstorp, Sweden, when that town belonged to Denmark, in 1546, and died at Prague in 1601. Some boys have to struggle against poverty when learning, but Brahe had to struggle against riches. His parents were distinguished people, and they hated the thought of their son studying for the love of learning. Wishing him to be a lawyer, they sent him to university after university that he might study law.

TYCHO BRAHE, THE RICH YOUNG DANE, AND HIS CITY OF THE HEAVENS

But all the while his heart was in the heavens. He had only a pair of compasses in the way of scientific instruments, but with these he set himself, when fourteen years of age, to study the distance of the stars. In spite of hindrances, he became famous as an astronomer, and when he was thirty his work attracted the notice of the King of Denmark, who gave him a pension, and built him the finest observatory that the world had up to that time seen. This was on an island near Copenhagen, and was called by a name which meant the City of the Heavens.

Here for twenty years Brahe worked at the task he loved. Copernicus had been three years dead when Brahe was born, but Brahe studied the great man's works, and improved upon them. He did not believe that the ideas of Copernicus were quite right. It seemed impossible to him that the earth could be the tiny globe which Copernicus's theory made it appear. Great as was the mind of Brahe, it was not great enough to receive that truth. He favored the belief of Ptolemy, that the sun went round the earth. The other planets, he said, undoubtedly go round the sun, but he believed that they and the sun go round the earth, which is fixed, and not to be moved out of its place.

THE SORROWS OF TYCHO BRAHE AND HOW GOOD CAME OF THEM

That was his great mistake. But his work was very valuable. He discovered new laws governing the motion of the moon; he helped forward knowledge with regard to comets, and he worked out, more accurately than anybody else had done since the days of Hip-

parchus, the position of some of the most important stars.

Brahe had many sorrows to bear when his friend the king died. His pension was stopped, his splendid observatory was broken up, and he had to go to Prague, where the Emperor Rudolf became his friend. It was a good thing for the world, for there Brahe met a youth who was to become even a greater astronomer than himself.

BRAVE JOHN KEPLER AND HOW HE READ THE MYSTERY OF THE STARS

This was John Kepler, the great German astronomer, who was born in Würtemberg, in December, 1571, and died at Ratisbon in 1630. His parents were poor gentlefolk, who managed to give him a good education, but had no riches for him. He was educated at a monks' school, and when twenty-two was appointed to lecture on astronomy. Up to then he had had no special love for the science, but he had read the writings of Copernicus, and believed in them. From this time forth he gave his life to the study of the skies.

He was always poor, and often, in later life, had difficulty in getting money enough on which to live. He had trouble also with the Protestant pastors.

What he desired to know was: How were the great bright bodies in the solar system kept in their position? He made many daring attempts to find the right answer. Some were well on the way towards the discovery; others were wild and wide of the mark. He wrote a book on what he had thought and done, and this brought him to the notice of Brahe, who had him appointed assistant to himself. Brahe had only two years to live, but those years were precious in the history of astronomy.

THE GREAT THINGS THAT KEPLER DID, AND THE COMING OF GALILEO IN ITALY

He taught Kepler all he could, and at his death left him all his papers and instruments, and all the facts which he had worked out. Kepler was appointed to the place which Brahe had held, and never rested until he had worked out the answer to the great questions which he had set himself. He discovered the laws which enable us to tell the place of any planet in its orbit—that is, its path through the skies—at any time past or present. Kepler's Laws became the foundation of the new astronomy studied on scientific lines.

All this time few men had ever seen the sky through a telescope. The great discoverers of the secrets of the heavens had had to do their work with unaided eyes. Galileo was the first real astronomer to turn a telescope towards the sky. He did much more than that. His name was Galileo Galilei. He was born at Pisa, Italy, in February, 1564, and died at Arcetri, near Florence, in 1642. His family had been distinguished, but his mother and father were poor, and they were anxious that he should have a good education as a doctor. They did not want him to study mathematics, lest the knowledge should lead him away from the profession which they wished him to follow. He was a very clever boy, showing skill in mechanics, in modeling, and in music; and he painted with such art that, had he been born earlier, he would certainly have followed the calling of an artist. He wished to be one, and on entering Pisa University he saw that to be a good artist he must learn something of geometry. The study of this subject opened a new field of knowledge to him.

HOW GALILEO GAVE THE DOCTORS THE FIRST MACHINE THEY EVER HAD

He read of the experiments of Archimedes, and how that great man had found out the quantity of base metal in his king's crown. Galileo saw that there was a simpler way than that of Archimedes, and he invented a balance which would solve the problem more quickly. He wrote an essay on it, which so pleased a great man that Galileo was appointed to lecture on mathematics at Pisa, and to continue further studies in the way that he had begun. There was now no further talk of his being either a doctor or an artist. He was allowed to follow science all the days of his life.

But before all this he had done something for the doctors which nobody else had done. He noticed a great lamp swinging in the cathedral at Pisa, and saw that, no matter how long or how short its swings, its beats were regular. This set him thinking, and he invented the first pendulum, and used it to measure the human pulse, so that by its aid a doctor could tell how fast the

heart of a patient beat, and with what strength or weakness. That was the first mechanical contrivance ever made to help the doctors in their treatment of the human body.

While studying at Pisa, Galileo felt convinced that much of the teaching of the day was wrong. People still believed in Ptolemy's system of astronomy, but for other mechanical laws they accepted what had been written by Aristotle, a scholar who, born nearly 400 years before Christ, became the tutor of Alexander the Great. Aristotle was a wonderful man, but not all that he said was right. One of his beliefs was that, according to Aristotle, the shot weighing ten pounds should have reached the ground in one-tenth of the time occupied by the shot weighing one pound. But they both reached the ground together. Galileo rejoiced at this proof, but the followers of Aristotle were furious. They would not believe what their eyes showed them. They could show by the books of Aristotle, they said, that such a thing could not be. But Galileo declared that, except that air resists a light article a little more than it does a heavy article, all bodies fall at the same rate. This declaration made everybody very angry, and students and

THE TRIAL OF GALILEO, WHO WAS PUNISHED FOR ATTACKING OLD IDEAS

Galileo, one of the first to make a telescope and look through it, was also one of the first to teach that the earth was a ball moving round the sun. Churchmen disbelieved him and brought him before the Inquisition. The Inquisitors tried to make him say that he was wrong in what he taught. After denying that the earth moved, we are told that he added under his breath, "And yet it *does* move," but this story is untrue.

if two bodies of the same substance fall from the same height, the heavier body will reach the earth first; that a body twice as heavy as another body must reach the earth in half the time of the lighter body. For 1,900 years nobody had thought of questioning this. Galileo was the first to do so. He saw that it was wrong, and he said so.

He took two shots, one weighing ten pounds and the other weighing one pound. He let them fall from the top of the leaning tower of Pisa, of which there is a picture on page 319. Now, professors at the university became his enemies.

Soon there was another grievance against Galileo. A powerful man wished to dredge the mud out of Leghorn harbor. The model of his machine was shown to Galileo, who said that it would be impossible to do the work with it. What he said was proved to be true when the work was actually tried; but, in the meantime, his honesty made his enemies so angry that he had to flee from Pisa to Florence.

Here his lot was miserable. His

father died; and Galileo now had his mother, a brother, and two sisters depending upon him. After two unhappy years he was made professor of mathematics at Padua. He was now 27 years old, and remained at Padua for eighteen busy years. He did an enormous amount of work for science, and people flocked from all parts of Europe to hear his lectures.

How Galileo with his telescope found that Aristotle was wrong

He was poorly paid, and had to act as tutor to pupils—many of whom became famous men—in order that he might have money enough for the wants of himself and his family. At the beginning of his career he had believed in Ptolemy's system and had taught it to his pupils; but as he learned more, he saw that Copernicus was right; and, though he knew that to teach Copernicanism meant danger to himself, he did teach it.

In 1609 he improved the telescope. Some had been made in Holland for use on land, but Galileo made a better one, for seeing the sky. We must not stay here over the making of the telescope, of which we read in another part of this book. The first thing that Galileo examined with his telescope was the moon. He saw that it was like our earth, full of mountains and hollows. The followers of Aristotle would not believe this. The moon was perfectly round and smooth, they said. But greater wonders were to follow.

Galileo discovered by the aid of his glass, that the system of planets was not quite what had been thought. He found that there were lesser planets revolving round Jupiter, just as other planets revolve round the sun. This excited the enemies of Galileo more than ever. How could such things be, they cried. One of them said: "There are only seven openings in the head—two eyes, two ears, two nostrils, and one mouth; there are only seven metals, and seven days in the week, therefore there can be only seven planets."

How authorities grew afraid and tried to stop the spread of truth

Galileo made them look through the telescope, and there were the heavenly bodies to be seen. "Oh, well," they said, "they are not visible to the naked eye, so they cannot exercize any influence on the earth; and, being useless, therefore they do not exist." The discovery brought Galileo new fame, and he was persuaded to go to Florence at a much larger salary. He discovered many other things in the sky, and showed that, although the earth goes round the sun, the sun itself turns round also.

Now, in 1600, Giordano Bruno, born near Naples about 1548, who had taught many strange theories of religion and science, was burned to death as a heretic. Galileo was not influenced by that. He declared, as Bruno had declared, that Copernicus was right. He declared, too, that the stars and planets are made of the same substance as the earth; that the universe is not limited, but unlimited in extent.

The Church now became aroused. It turned in 1611 to the works of Copernicus, and declared that they should not be read. A commission to investigate what he had taught, conducted by officers of the Church, summoned Galileo before it, and warned him not to teach that the earth goes round the sun. If he did not agree, he might take the consequences of his conduct. He was not punished however at this time.

How Galileo was punished and wrote books till he was blind

Sixteen years passed away, and then Galileo continued his studies and finally wrote a book defending the Copernican system. For his disobedience he was again called before the Inquisition. In sackcloth, he was made to kneel and swear he would never again say or believe the earth moves round the sun.

He was now an old man, and perhaps feared that the torture awaited him if he disobeyed. So unwillingly he swore. Then he was sent away as a prisoner, but was afterwards given his liberty, though spies watched him to the end of his days. He worked at his discoveries in the heavens, and wrote books of the highest importance, till he became blind. The man, who, more than any other, was to teach us what the heavens show us, was himself unable to see their glories. He died when seventy-eight, conquered, but not before he had given the world a great heritage of knowledge upon which much that we know of natural

science has been founded. We see how man after man built upon the foundations laid by those who had gone before. Copernicus and Kepler and Galileo prepared the way for Jeremiah Horrocks, "the founder of English Astronomy," who observed the transit of Venus, and Sir Isaac Newton, the great Englishman, who was born at Woolsthorpe, Lincolnshire, in 1642, and died in London in 1727. He was a dull boy at school, yet he beat all the other students at mechanics and mathematics and in course of time he became famous at Cambridge University. Galileo had given the world the law of bodies falling to the earth, but nobody had thought that such laws might affect the heavenly bodies. One day Newton, when sitting in his garden, saw an apple fall from a tree. "Why should that apple fall?" he wondered. "Why did it not float away or rise into the air?" He thought out the problem and worked at it until he came to the conclusion that all things are drawn towards the centre of the earth. Then, going a step further, he discovered that the planets are drawn towards the sun in the same way. Little by little he discovered the law of gravitation, which explains the movements of the heavenly bodies.

We get a great lesson in patience and care from Newton. At the beginning he could not explain the movements of the moon and planets, because he had no figures upon which he could rely, giving the size of the earth. No matter what answer to his problem he wanted, that answer always came out incorrect, through the absence of the necessary figures. Here he was, on the eve of one of the greatest discoveries in history, but he put aside this work for seven whole years. Then, in 1670, a scholar named Picard produced reliable figures as to the size of the earth. Newton took up his work where he had left it, and

THE FOUNDER OF ENGLISH ASTRONOMY WATCHING THE SHADOW OF A PLANET ON THE SUN

This picture, painted by Mr. Eyre Crowe, shows Jeremiah Horrocks, "the founder of English Astronomy," observing the transit of Venus. He darkened his room at the date—November 24, 1639—which he had alone predicted, and placed a tube out of the window pointing towards the sun. Then, by placing a board at the opposite side so that the disk of the sun was thrown on it and moving it as the sun moved, he was enabled to watch the shadow of Venus cross the disk of light. He was thus able to calculate the size of the planet. He died at the early age of 23, but made other useful discoveries in astronomy, and concerning the ocean tides.

finished it in triumph. By this time men were beginning to realize the importance of astronomy, and it was proposed to King Charles II. of England that astronomers should find the longitude at sea, and so enable sailors to steer in safety and with knowledge of the course they were following.

John Flamsteed, who was born near Derby in 1646, and died in 1719, had gained a reputation by his researches in astronomy, and he was consulted about the proposal. He said that so little was known of astronomy that the proposal could not be carried out. So in 1675 he was appointed the first Astronomer Royal, and Greenwich Observatory was built solely that he might make careful observations of the stars, to enable sailors to find their way in safety across the seas. He did his work nobly, making maps of the stars such as had never before been seen.

PULLING DOWN A GATE AT THE TOWER TO BUILD GREENWICH OBSERVATORY

The observatory was begun in a very small way. A gate-house at the Tower was pulled down to provide wood; iron and lead and bricks were taken from Tilbury Fort; and $2,500, obtained from the sale of spoilt gunpowder, provided the money necessary for wages, and so forth.

Flamsteed at first had only $500 a year, and had to buy his own instruments. This makes his success all the more wonderful, especially when we consider that his health was so bad that he could hardly do his work, let alone teach the pupils, whose fees were necessary to enable him to live. He quarreled, as invalids do, with his best friends, among whom were Newton and Edmund Halley. The latter was a born astronomer. He was a native of London, where he was born in 1656, and before he was nineteen he had made such progress in astronomy as to be able to say that if a star were displaced in the heavens he would at once detect it.

When he knew that Flamsteed was making a map of the stars to be seen from our skies, Halley wished to make a catalogue of the stars seen in the southern skies, on the other side of the world. His father, who was rich, and proud of his boy, gave him money and consent, and young Halley rushed away from Cambridge without waiting to take his degree, and spent eighteen months at St. Helena, making a map of 341 important stars which we on this side of the world never see. Afterwards he became Astronomer Royal in succession to Flamsteed, and did splendid work. He predicted the return of the comet which is named after him.

THE MAN WHO MADE ISAAC NEWTON PUBLISH HIS GREAT DISCOVERY

The most important thing he did, however, was to make Newton publish his great book. But for Halley, Newton never would have published it, and the world might have waited a century for the knowledge which that book, and that book alone, could give. Halley was made a captain in the navy in order that he might continue his study of the moon and stars, and the tides of the sea. He died in 1742.

James Bradley was Halley's successor. A native of Sherborne, Dorset, he was born in 1693, and died near his birthplace in 1762. His most important work was the discovery of what is called the aberration of light. We know that light travels to us from the stars, at the rate of 185,000 miles a second. What we see is not the star, but the light of the star. That light takes a definite time to travel to us, and while it is on its way here, the earth is spinning on its path through space; and we see the light of the stars, not in the place where the star actually is, but where the star was some time before. This was the first clear proof of the earth's actual motion, and it was his discovery of this that made Bradley famous.

THE FIRST WATCH TO HELP THE SAILOR TO FIND HIS WAY AT SEA

The next great Astronomer Royal was Nevil Maskelyne, who was born in London in 1732, and died at Greenwich Observatory in 1811. He did more than any of the others to find the longitude at sea. In his time the first watch which would keep time at sea was made. That was a great thing. With the help of this chronometer, which carried Greenwich time out to any part of the waters, mariners had now only to observe the position of the heavenly bodies, and by comparing the time where they were with the time of the Greenwich watch, they knew exactly where they were at sea.

After Maskelyne came Sir George Biddell Airy. He was born at Alnwick,

Northumberland, in 1801, and died at Greenwich in 1892. He did an enormous amount of work in mapping the heavens and applying his knowledge to geography on land and sea. It was he who brought the science to the pitch which it finally attained at Greenwich, so that it has been said by a great man, Professor Newcomb, that if all the knowledge of this branch of astronomy were utterly lost, it could be entirely replaced at Greenwich Observatory.

WILLIAM HERSCHEL AND HIS BRAVE SISTER CAROLINE

We must not overlook the Herschels, the most brilliant family in English astronomy, though they had nothing to do with the Greenwich Observatory. The first was Sir William Herschel, who was born a poor boy in Hanover, in 1738, and was trained as a musician to play in a band. When he went to England he studied mathematics and astronomy. He was too poor to buy a telescope, so he manufactured one for himself. With this he made some famous discoveries, of which the greatest was the planet Uranus. He was greatly assisted by his sister, Caroline Herschel, one of the cleverest and most lovable women that ever lived.

Caroline's mother did not love her, but made her a drudge in her poor house, and would not have her educated. Her father, who *did* love her, gave her music lessons in secret. A little music and a little knitting—those were her only kinds of work, apart from scrubbing and cleaning, up to the time of her father's death. Then she toiled to learn dress-making and other sorts of work, sitting up late at night, after she had done the housework. At last her brother, William, who was very fond of her, sent for her to come to him, and they lived at Bath, where he gave her singing lessons and taught her English and arithmetic, and she was much happier.

HOW CAROLINE HERSCHEL HELPED HER BROTHER TO BECOME FAMOUS

Caroline, on her part, learned to imitate the violin by humming with a gag between her teeth, so that she might perform at concerts and help the funds of the home. While her brother was making the telescope, Caroline became his cook and workshop "boy." She helped him to polish the glasses, she cooked his food, and actually fed him with it while he was at work; she read books to him while he toiled. She sang at concerts with success, but gave up music to assist her brother in astronomy. She used to sit up all night with him to watch the stars. She copied his papers, helped him with his star-maps, kept the house, did the needlework, and entertained company. She used to fill up her spare time with polishing mirrors for his telescopes.

Seldom has there been another such woman as Caroline Herschel. She had her reward in time, for she herself became a wonderful astronomer, and made splendid discoveries All her life was like a beautiful fairy story, right up to the end, when, her brother dying, she gave all her little savings to his son and family, and went back to live, not very happily, with her other relatives in Hanover. There she died, when ninety-seven years old, in 1848, honored by all the great men of Europe, and beloved and admired as few women have been.

THE BOOK THAT MADE CAROLINE HERSCHEL WEEP FOR JOY BEFORE SHE DIED

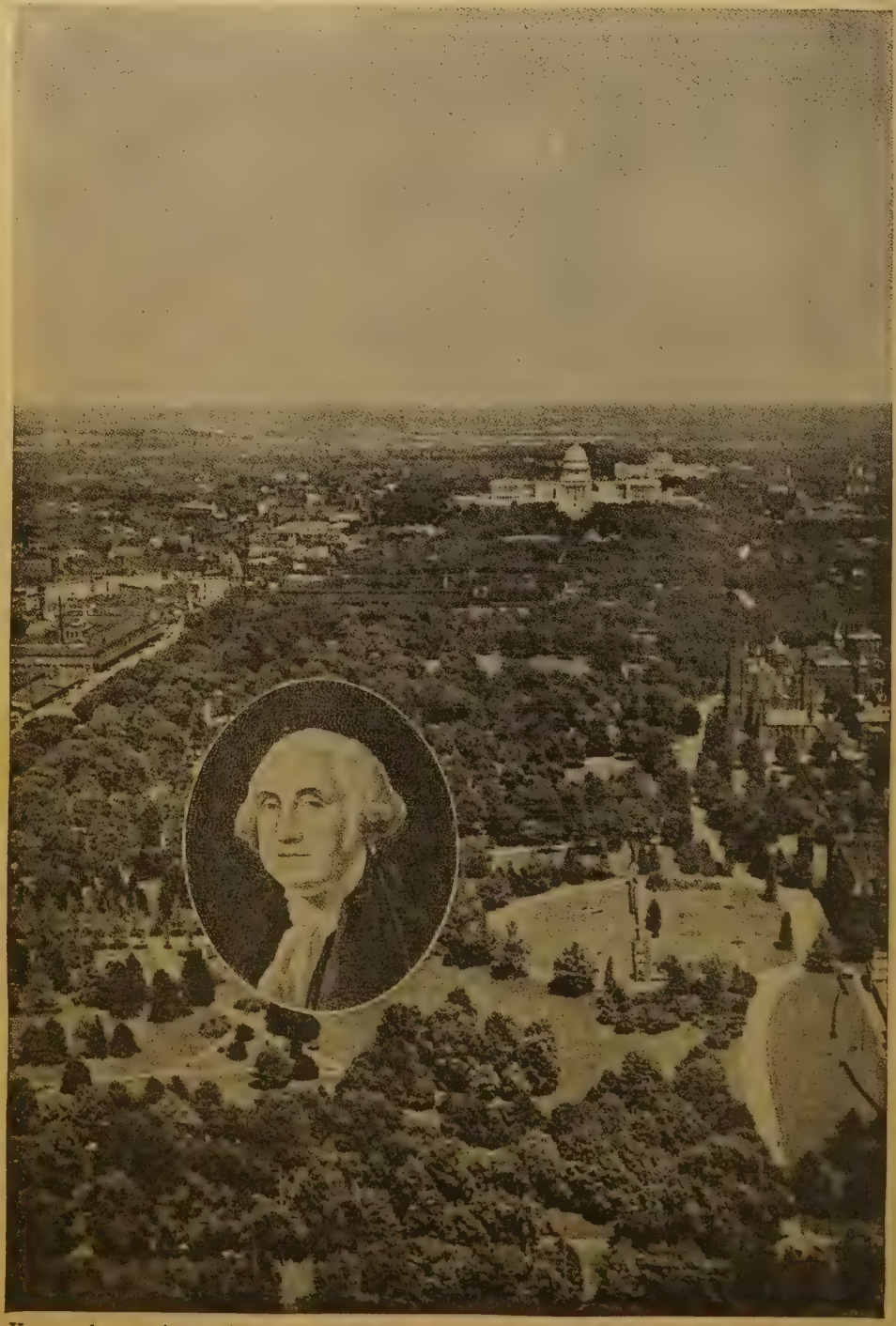
The nephew to whom Caroline gave part of her money was Sir John Frederick William Herschel, her favorite brother's son, and a greater astronomer than his father. He carried on the work which his father and aunt had begun. He made a catalogue of all the stars seen in our skies, then he went to the southern hemisphere and made a catalogue of the stars seen there. It was the greatest joy of his life that he was able to send a copy of the great book to Caroline Herschel just before she died.

This was his most splendid work, and the dear old lady wept with pride and pleasure at seeing what her nephew had done. She was the more happy from the fact, that in the noble book there was the result of the work which she had begun under difficulties when cook and observatory "boy" to her brother, and had continued when herself a world-famous astronomer.

To such men and women, struggling often with poverty and difficulties that we can hardly understand to-day, we owe our knowledge of the skies, of which men can now make maps as clear and as certain as the maps we make of our own country.

THE NEXT STORIES OF MEN AND WOMEN BEGIN ON PAGE 1745.

GEORGE WASHINGTON & WASHINGTON CITY



Here we have a picture of the city of Washington and the portrait of its founder. In the distance we catch a glimpse of the Capitol, and the Congressional Library beyond, and in the foreground we see the trees, the wonderful trees of our Federal City. The planting and cultivation of the trees in Washington come under the governmental authority, and a large sum is spent yearly upon their improvement.

Copyright by Underwood & Underwood, N. Y.

THE STATE, WAR AND NAVY DEPARTMENT BUILDING

WASHINGTON, OUR CAPITAL CITY

CONTINUED FROM 1438

NOTHING so increases patriotism as a visit to Washington, where many for the first time realize the immensity of the nation, its wealth, its importance, and its world relations. We have seen the wonders of Yellowstone Park and have traveled through the weird underground world of Mammoth Cave. To-day we will take a trip in imagination along the broad vistas of the streets of our national capital and pay a visit to some of its most important buildings. It is morning when we reach the city. The first sight of interest that unfolds before our eyes is the big new Union Railway Station, where we alight. It is a huge building whose magnificent proportions dwarf into comparative littleness the early crowds of people who hurry through its great interior.

THE PEOPLE OF WASHINGTON NEVER HURRY

We emerge from the bustle of the station into the streets of Washington, and getting into a taxicab, tell the chauffeur to take us to the Capitol. As we pass along the street the first impression that we receive is that everything has come to a standstill. It is still early and the streets stretch out before us wide, tree-lined and seemingly almost deserted. Only an occasional trolley, automobile or tradesman's wagon passes us. Nobody seems in a hurry. The pedestrians on the sidewalks walk leisurely along as if they had the whole day before them in which to accomplish their errands.

But we have reached the Capitol, and, "How magnificent!" we exclaim breathlessly, as we lean forward to get a better view of the great dome, the crowning glory of the Capitol. For a few minutes a majestic English elm partly obscures it from our view and we note the noble simple lines of the two—the great wide spreading tree and the dome, "hanging like a great brooding bubble" against the clear blue sky.

We leave our taxi at the eastern front and climb the broad flight of steps that lead to the rotunda of the Capitol. On each side of us is a colossal group of marble figures, one representing Persico's Columbus and an Indian girl, and the other a pioneer in desperate conflict with a savage. Before us are the beautiful bronze doors of Randolph Rogers, representing a series of scenes in the life of Christopher Columbus, from his first voyage in search of the New World, to his sad death at Valladolid in 1506.

Through these massive doors we enter the rotunda or interior of the dome. The Capitol possesses some interesting statuary and paintings, and as we pass through its halls, we may see them.

Copyright, 1910, 1918, by M. Perry Mills.

As we come into the great circular hall of the rotunda, we pause for a moment at the door to note the magnificent columned corridors spread out before us. The walls are decorated with a bewildering array of paintings, sculptures and frescoes. Over us the vaulted canopy of the dome is aglow with color. As we stand breathlessly gazing about us and wondering where we shall begin our inspection of the pictures, a guide who has been viewing us from the distance hastens forward and takes us under his wing.

The canopy, he explains, is an allegorical fresco, painted by Burnside, representing Washington surrounded by all the Arts, Sciences and Industries.

There are some paintings upon the rotunda walls that are worth noting—The Landing of Columbus, The Discovery of the Mississippi, The Baptism of Pocahontas, The Embarkation of the Pilgrims, and a series of impressive pictures, by Trumbull, showing scenes in the American Revolution. We wander along admiring these and the fresco by Brumidi and Castigini that encircles the wall. We mount into the whispering gallery just below the canopy, and as we stand there we can distinctly hear the murmured words of a party on the opposite side of the gallery.

Some bad statues of our great men

We visit the National Statuary Hall, one of the most beautiful rooms in the Capitol. It was once the Hall of the House of Representatives, before the new wing was built. It is semi-circular in shape and adorned with noble columns. The domed ceiling, decorated after the design of the Roman Pantheon, rises 57 feet to the cupola that lights the room. Around the room on their marble bases stand statues of men who have been famous in the history of our country. Many of them are very badly done and reflect more credit upon American patriotism than upon American art. Among these statues is one that arrests our attention—the figure of a woman—Frances Elizabeth Willard, the first woman to be given a place in Statuary Hall. The most interesting figure in the hall is the statue of Père Marquette, and there is in another place a fine head of President Lincoln of which you will find a picture elsewhere in this book.

As we turn and look at the door through which we have just entered Statuary Hall from the rotunda, we pause to glance at the great clock above the door. Behind the clock is a winged car resting on a globe circled by the Zodiac. This car is meant to represent Time, the guide tells us. In the car is the marble figure of a woman called "History." The clock was designed by Franzoni, a sculptor popular many years ago.

We take a peep into the Supreme Court Room, once the Senate Chamber; and see the Hall of Representatives and the Senate Chamber, impressive in their simplicity—the semi-circular rows of seats so alive with an atmosphere of business that they seem just to have been left by their occupants.

As we pass through the corridor our attention is arrested and held by a picture on the wall of the landing of the West Stairway. It is called "Westward Ho" and has for its legend Bishop Berkeley's words, "Westward the Star of Empire takes its way." The picture represents an emigrant caravan stopping to rest in one of the defiles of the Rocky Mountains. The scene holds all the wild grandeur of the rough mountain pass, yet beyond is a glimpse in the distance—the Land of Promise—a land wonderfully fair to see.

We visit the President's Room with its quiet richness of decoration; we see the Senators' Reception Room, known as the Marble Room because it is constructed wholly of that material, with stately Corinthian columns of Italian marble, paneled walls of Tennessee marble and wonderful ceiling of marble from Vermont. We inspect the Public Reception Room, a richly furnished apartment, glowing with brilliant colors and having a vaulted ceiling with allegorical frescoes depicting War, Peace, Liberty, Plenty, Power, Temperance, Prudence and Justice.

The most beautiful library in the world

We leave the Capitol and walk a little way through its beautiful grounds to the Library of Congress—an impressive marble building, three stories high, surrounded by gardens with broad stretches of greensward and trees.

We enter the Central Stair Hall, a magnificent structure of polished marble. On each side of us rise lofty rounded columns with elaborate capitals of Cor-

WHERE OUR NATION DOES ITS BUSINESS

Here is a picture of the east front of our Capitol at Washington seen over the tree tops of the Capitol grounds. Note the majestic simplicity and beauty of the building, and the great white dome against the background of the sky. The Capitol is a building of which we have no cause to be ashamed. The Senate wing to the right and the House wing to the left were constructed after the center portion. People generally see the west front first, as the greater part of the city lies to the west.

inthian design. The lofty arches rise above, exquisitely decorated with marble rosettes, palm leaves and foliated designs of wonderful delicacy. We climb the low broad stairway slowly—pausing now and then to admire one or another of the carved figures in its alcoves. In the entrance pavilion above we see the wonderful series of paintings by H. O. Walker, depicting Lyric Poetry and the Poets' Boys:—Emerson's, Uriel; Wordsworth's, "The Boy of Winander;" Milton's, Comus; Shakespeare's, Adonis; Keats', Endymion; Tennyson's Ganymede.

In the South Curtain Corridor are "The Greek Heroes," painted by Walter McEwen. These are nine pictures having for their themes the Greek myths of Paris, Jason, Bellerophon, Orpheus, Perseus, Prometheus, Thesus, Achilles and Hercules. In the Representatives' Reading Room, we find two beautiful mantels showing Law—a woman, radiant faced, enthroned, with Fraud, Discord, and Violence on her left, and Truth, Peace, and Industry upon her right—and History with Tradition and Mythology, one on either side.

The results of good and bad administration are shown in a series of paintings we see in the Reading Room Lobby, while the Evolution of the Book is beautifully pictured in six panels, painted by John W. Alexander. The Family, Religion, Labor, Study, Recreation and Rest, painted by Charles Sprague Pearce, decorate the North Hall. The ones called "The Family" and "Religion" are singularly beautiful, the latter showing two worshipers, a man and a woman, kneeling before a rude stone altar from which ascends the smoke of their sacrifice, and before the rude altar and clustering close about it are some wild growing flowers of the iris plant.

And so we wander on, now inspecting the panels, now some dancing figures of the Muses, now the Graces, now the Sciences and Arts. Two visions of "The Seasons" are seen in the panels by F. W. Benson and the sculpture reliefs by Bela L. Pratt. Which is the most beautiful of these, we hardly know, both so win us by the simplicity and flowing beauty of their lines.

Two lunettes, one of War, and the other of Peace, appear on the walls of the Northwest Gallery of the third floor. War represents a procession returning from battle with two hounds straining at their leash; then foot-soldiers with spears and bucklers; then the king on his white horse riding over the fallen bodies of the slain, the color bearer, and last of all the wounded borne on litters carried by their companions. In Peace, we see a troop of worshipers bearing a votive offering, the effigy of a goddess in the centre and a boy leading an ox bringing up the rear.

WASHINGTON, THE "CITY OF MAGNIFICENT DISTANCES"

We leave the Library, and driving around the Capitol grounds come out on Pennsylvania Avenue. We are going to the White House. We lean forward in our seats that we may get a better view of the streets through which we are passing. Washington has been called "the City of Magnificent Distances," and it seems a truly beautiful place to us, as we bowl slowly along the mile of the avenue. The avenue is so broad that there is no feeling of being crowded. The street cars in the middle seem to take up scarcely any room. Up the side streets we see trees, trees, trees, and where streets and avenues cross there are so many beautiful little spots of green. "On every side of us there is a picture"—a picture of unruffled tranquillity, of beauty and of prosperity—rare combinations in the national capital of a large country. We think of the changes that have taken place since President Washington first chose this spot upon the banks of the Potomac for the seat of government in 1790. Then it was an untrod wilderness, and as late as 1800, when the Capitol itself had been built, a belle of the times described it as "a town of streets without houses."

WASHINGTON A HUNDRED YEARS AGO

Oliver Wolcot in a letter to his wife says there was at that time "one good Tavern about forty yards from the Capitol, and several other houses and buildings, but I do not perceive how the members of Congress can possibly secure lodgings unless they will consent to live like scholars in a college or monks in a monastery, crowded ten or twenty in one house and utterly secluded from society. The only resource for such as wish to live comfortably will be found in Georgetown, three miles distant over as bad a road in winter as the clay grounds near Hartford."

Gouverneur Morris wrote humorously,

THE GREAT LIBRARY OF CONGRESS

The Library of Congress is one of the most impressive public buildings in the city of Washington. It stands on the edge of the Capitol grounds and the long vista of the city streets beyond gives a very good idea of the way in which the avenues radiate from the Capitol like the spokes of a wheel. All the wonderful decoration, both of painting and sculpture, was done by American artists. The Library of Congress contains one of the largest collections of books and maps to be seen anywhere in the world. Authors, or publishers, must send the Librarian two copies of every book, or periodical, they wish to copyright, that is, to claim as their property.

1689

"We want nothing here but houses, cellars, kitchens, well-informed men, amiable women and other trifles to make our city perfect. . . . In short it is the very best city in the world for future residence."

THE HOME OF OUR PRESIDENTS

At last we reach and pass the Treasury Building and see set in a noble Park the residence of our Presidents, known to every one as the White House. Washington himself selected the place for the White House, and laid the corner-stone in 1792, and lived to see the building completed, though he never occupied it. That honor was reserved for his successor, John Adams, and his wife, Abigail, about whom you may read on another page of our book. The story of its destruction by the British troops has also been told on page 401. But it was soon rebuilt and, except for new coats of dazzling white paint, was little changed until 1902–3 and again in 1909, when additions were built on each side.

These new rooms are only one story high and hardly show above the terraced lawn, but they afford room for the President's offices and for entrances into the public rooms, up to that time in the main building.

Let us enter the Public Rooms, which are sometimes open during certain hours of the day. We make our way through a long colonnade on the east end which leads to the basement corridor, where hang the portraits of many of the mistresses of the mansion. Along the walls

THE WHITE HOUSE AT WASHINGTON

Here is a picture of the White House, with one of the new wings built by President Roosevelt during his administration. It is interesting to know that Washington chose the site of the building and that John Adams was the first President to live in the Executive Mansion. It was burned by the British during the War of 1812, but was at once rebuilt. The walls of the building were blackened, but not destroyed.

are cases in which are bits of historic china or ornaments used in by-gone days. Ascending the broad stairway, we reach the centre hall, from which we may enter the great East Room where the formal receptions are held. This magnificent room is bare of furnishing, but the proportions are so beautiful and the colors so harmonious that we do not realize it.

The other rooms are not usually open to the public, but if we have special permission, the guide may take us into the Blue Room, with its hangings of blue silk, and the clock sent to Lafayette by the great Napoleon and by him presented to Washington. The Green Room has green

velvet on the walls and contains portraits of many of the Presidents besides interesting things sent by foreign rulers. The glory of the Red Room is the portrait of Washington by Gilbert Stuart, the picture which was saved by Dolly Madison. In the State Dining Room the formal dinners are given, and a hundred guests may sit down at the massive mahogany table. The private rooms of the President's family are not shown.

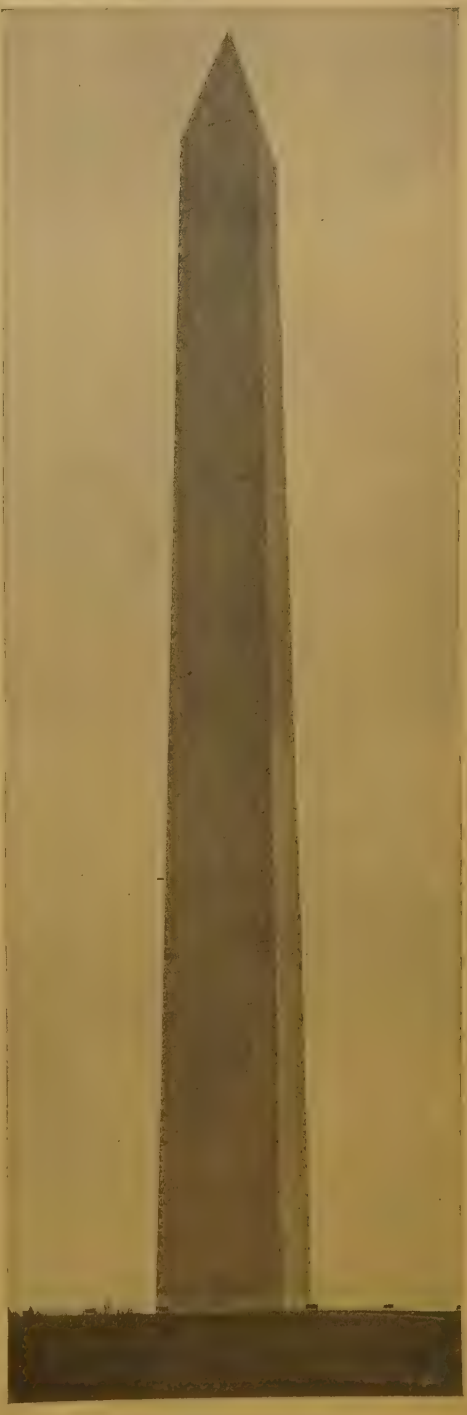
We leave the White House and after a delightful little lunch in a restaurant on Pennsylvania Avenue, we drive back through the Presidential Park, bound for the Washington Monument. Sightseeing is rather tiresome, however enjoyable, and we gladly settle back among the cushions of our taxi to view comfortably the green, fresh beauty of the public grounds through which we are passing. "The trees! The wonderful quiet majesty and greenness of the trees!" we exclaim with a little sigh of deep content.

THE WONDERFUL TREES OF WASHINGTON

On every side are the rolling lawns and great trees in a glory of summer greenery. A soft midday breeze stirs through the wide-spreading elms on one side and ruffles the leaves of sturdy oaks and sugar maples on another. "No such trees adorn a city anywhere else in America." Each avenue is planted with one variety only. The oaks that line one street are superb. The great horse-chestnuts that bloom on another, offer an ever-growing enjoyment of vista of leaf and flower. The beauty of shrubs, the evergreens, the great magnolias of the South, the symmetrical lawn trees that are profusely used to adorn the circles and the small squares, fills us with a sense of peaceful satisfaction. How the "beauty-hungry souls" of the children of the slums of New York or London would enjoy the streets of Washington! "Green everywhere—just like a park!" we can imagine them exclaiming, wonderingly.

Since 1872 the city of Washington has been systematically planting and controlling the trees under governmental authority and it has spent hundreds of thousands of dollars on this good work.

Suddenly through the trees we catch our first real glimpse of the Washington Monument. How purely it raises its straight shaft into the air, a majestic tapering pyramid of white against the sky.



THE MONUMENT

The Washington Monument was completed in 1885 in memory of George Washington, the Father of Our Country and the first President of the United States. From the little windows in the sloping sides of the top of the monument, a wonderful bird's-eye view of the city of Washington can be obtained.

We descend from our taxi and enter the monument. The interior is lighted by electricity. The elevator carries us nearly to the top, a height of 555 feet. As we slowly rise up the elevator shaft we catch glimpses through the cage of a series of stones—on the landings of the stairway—dedicated to the memory of Washington.

ONE OF THE MOST BEAUTIFUL MONUMENTS IN THE WORLD

There are 170 of these stones—many of them notable for their beautiful and elaborate carving. When we have reached the height of 504 feet we leave the elevator, and step out on a platform. Here the walls are pierced with eight port openings, or windows, two on each side. Through these we get an extensive bird's eye view of the city. On one side of us stretches the great Parkway of the Presidential Grounds with the Treasury, the State, Navy and War Departments, the White House, and the beautiful monument to President Lincoln in the distance; on another side we see the intervening tree tops, we catch a glimpse of the Smithsonian Institute, the National Museum, and the white gleaming dome of the Capitol; to the south flow the waters of the Potomac between their green winding banks; while yonder to the west lie the wooded slopes of beautiful Arlington, where lies the "Field of the Dead," containing the bodies of many who gave their lives for their country in the Civil War.

From our high far seeing view of the great and singular city spread out at our feet, we realize for the first time how strikingly different Washington is from all our other cities. Not only is it noted for its dignified public structures that house the government's business, for its extensive public parkways of the Mall, the Public Gardens, the Capitol Grounds, and the President's Park, but it is not a city laid out in checker-board fashion as other cities are. The avenues radiate from the Capitol and the Executive Mansion, north and south and east and west, in straight broad lines like the spokes of a great wheel, and here and there, where they cross the streets, are dotted with circles or squares of little parks that break the monotony with spots of rich green. The arrangement is confusing at first, but we soon grow accustomed to it, and can readily find our way.

THE TWO MEN WHO PLANNED OUR CAPITAL

Two names are unbreakably linked with the plan of this great city,—George Washington, the first President of the United States, and Peter Charles L'Enfant, a civil engineer who came to this country about 1777. It was Washington who chose the site of the Federal City upon the banks of the Potomac,—the "river of the meeting of the tribes;" it was L'Enfant who surveyed the ground and designed its plan of construction.

Leaving the monument behind us, we drive through the Agricultural Grounds, where is the building of the Agricultural Department, and crossing the street, we enter the grounds of the great Smithsonian Institute. Through the green screen of the trees we catch glimpses of the red sandstone building of the Institute itself, and of the National, and New National Museums, and of the Medical Museum.

We have only a short time left, and we decide to spend it all in the New National Museum. We enter the building from the park, and turn to the right to reach the great collection of animals, made by President Roosevelt, which is dear to the heart of every child who sees it. Here are many of the animals of which we read in this book. There are bears and lions, antelopes and deer of all sorts, tall giraffes, striped zebras, monkeys of all kinds, and many beautiful birds. From one visit, we cannot attempt to remember them all. There are many other things of interest in the museum. But we can think of nothing to-day but the animals.

We are leaving Washington, our city, the capital of our own dear land.

"Washington, above all the cities on the earth, belongs to all the people of a great nation, and not merely to its inhabitants or to a ruler. Through his chosen representatives in Congress, each American voter has an equal share in the actual detail of its government; for, again, Washington alone of American cities is governed, not by its residents, but by the National Legislature." No intelligent American can visit and look upon its beautiful streets and its handsome public buildings without a better realization of the value of his citizenship. "It is our Federal City—the tangible evidence in stone and metal of the great dream of the Father of our Country."

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 1831.

WHAT THIS STORY TELLS US

THE word "chemistry" really means the study of what happens when things are mixed or put together; and the study of the making and unmaking of compounds is all-important, for almost everything that happens on the earth and in living creatures depends upon it. In these pages we learn some of the ways in which the elements unite to make compounds, how these compounds are always made according to a fixed rule, which is really one of the great proofs that the elements are made of atoms, and how all the world over, and in our own bodies, compounds are being made and unmade every moment of our lives. We come now to what seems puzzling at first, but is really simple—the neat and useful way chemists have invented for describing compounds, and the changes that may happen when the chemist adds one to another. These *formulas* and *equations*, as they are called, are a little difficult at first, but so were the letters of the alphabet once, and almost everything else that is really worth knowing.

THE MAKING OF COMPOUNDS

CONTINUED FROM P. 1570

WE have now said all that need be said about most of the principal elements; but the word chemistry really means mixing, and it is greatly concerned with what happens when different elements are added to each other. If things did not happen when this was done, the world would simply stay almost unchanged from moment to moment, nor could there be any life on it. So the making and unmaking of compounds is really the greater part of the whole study of matter.

What a compound is we already know, nor shall we confuse it with a mere mixture. Sometimes, when the chemist—that is to say, the mixer—mixes two elements, they simply remain mixed, and nothing happens. What is all-important is that very often, when he mixes them or puts them together, they combine with each other and form compounds.

We have studied some compounds already, especially the most important of them all, which is water. But the number of compounds that naturally exist in the world is far beyond anyone's counting, whilst the chemist can make a countless number more which do not exist at all in Nature. Some of these which he makes are extremely valuable to us. Therefore, we must learn all we can about the making of compounds, and also about the unmaking of them, which is equally important. The word to describe the making of a compound is, of course, composition, and the word to describe the unmaking of it is decomposition. Almost everywhere these two processes are ceaselessly going on, and the whole life and change of the earth depend upon them.

We can clearly describe a compound, whether it be a very simple one like water or common salt, or whether it be the most complicated compound in the world, like hæmoglobin, the red coloring matter of the blood. A mixture may contain any proportion of the things that make it up—a little of one or a little more, much of another or a little less. It is a quite indefinite thing, but a compound is never so. If it is really a compound it is a perfectly definite thing.

The proportions of nitrogen and oxygen in the air may vary to any extent, for air is a mere mixture. But the proportions of oxygen and hydrogen in the compound water are constant and exact, always and everywhere. Any given compound always contains the same elements in the same proportion, and it is this fact of definite composition that is the mark of any compound. Water always contains eight times as much of oxygen by weight as of hydrogen.

Already we have learned how to understand this, for we know that to make a compound a certain number

Copyright, 1908, by Amalgamated Press, Ltd.

of atoms, one or more, of an element must combine with a certain number of atoms of another element—as, for instance, two of hydrogen to one of oxygen to form a molecule of water. There simply cannot be a compound with two and a half atoms of hydrogen to one of oxygen.

THE IMPORTANT DISCOVERY MADE BY A SCHOOLMASTER A HUNDRED YEARS AGO

The history of our knowledge is that this fact of the constant proportion of elements in a compound was discovered first by the Manchester schoolmaster, John Dalton, more than a hundred years ago. It was from this fact and others like it that he argued the existence of atoms which behave as we have seen that they behave.

We can understand the argument best by looking again at water. We call it H_2O, and we know that that means hydrogen two atoms, and oxygen one atom. But in this case, as in hosts of others, the two elements can form more than one compound with each other. There is, for instance, a compound looking rather like water, but really very different, which has two atoms of oxygen to two of hydrogen in each molecule, and therefore must be written H_2O_2.

We know that this is so because, when we split this compound up, we find that any given quantity of it always contains twice as much oxygen as there is in water. That can only mean that the compound has the composition we have said—that it is made of molecules each of which contains twice as much oxygen as the molecule of water. But we never find any compound which contains one and a half times or two and a half times as much oxygen as in water. So long as oxygen and hydrogen are made of atoms that could never happen.

THE ELEMENTS NEVER MIX TOGETHER IN FRACTIONS OF ATOMS

Nitrogen and oxygen supply still better instances. They actually form five compounds with each other. When we weigh out the amount of nitrogen and oxygen in each of these, the proportions are always very simple. One of them always contains just twice as much oxygen as another. Another of them contains three doses of oxygen to two of nitrogen, and another five of oxygen to two of nitrogen. But you see it is always three or five or two, never nearly five or a little more than three. Nowadays, then, we can say exactly how these compounds are made. It is simply a question of the number of atoms of the two elements in the molecule of the compound. We need not trouble about the names, but here are the five compounds, all in a row: NO, N_2O, NO_2, N_2O_3, N_2O_5.

One of these you may, perhaps, know very well, and that is N_2O, for this compound is laughing-gas, which the dentist uses to kill—for a little while—our sense of pain.

This is the best instance I know to show that when elements combine with each other, they always must combine in simple proportions; and if they form more compounds than one with each other, then the various proportions are simple multiples of each other. It is either a case of two parts to one, or of one part to one, or of three parts to one, or of three parts to two, or something of the sort; but fractions never—never halves or quarters, or anything at all but whole parts.

A DISCOVERY THAT WILL MAKE JOHN DALTON'S NAME LAST FOR EVER

This great law, from which Dalton learned the existence of atoms, and the way in which compounds are made, has been known all over the world for a hundred years as the law of multiple proportions. It can only have one meaning—namely, that compounds are made of molecules with a definite number of atoms of each compound.

Wherever you find a specimen of, shall we say, N_2O_5, there, if you split it up, you will find the exact proportions by weight of nitrogen and oxygen, which can only mean that this compound must be made of molecules, every one of which consists of exactly two atoms of nitrogen and five of oxygen. If there were no such things as atoms, the elements could not behave in this way; therefore there must be atoms, and there are. That was the great argument and the great discovery which will make the name of Dalton last as long as time.

If we call the weight of the atom of hydrogen one, then the atom of nitrogen is fourteen, and the atom of oxygen sixteen. So in thirty ounces of NO, you will always find exactly fourteen ounces of nitrogen and sixteen of oxygen; and the proportions by weight in the

other compounds you can easily reckon for yourself if you remember the composition of the one you require.

WHAT A FORMULA IS, AND HOW IT BRINGS A PICTURE TO THE CHEMIST'S MIND

Names like H_2O, NO, CO_2, and so on, are called *formulas*. Each of them is the formula of the thing it describes. That is not a very difficult word, and it is used every day in chemistry. After this, we shall be able to talk about the formula of water, the formula of carbon dioxide, or anything else we please. When you look at a chemical formula like H_2O, and compare it with what you find when you decompose water, and notice the proportions of hydrogen and oxygen in it, you find that the formula exactly expresses to anyone who understands it, in very little space, the fact that in water everywhere are eight parts of oxygen by weight to one of hydrogen. An atom of oxygen is sixteen times as heavy as one of hydrogen.

Now we must look at a few of the ways in which compounds may be made. The simplest we know quite well already. It is *direct union* of the elements that make the compound. We know it in the case of burning or combustion; and when we use these words we usually mean that, in the course of this direct union, some light is given out. When hydrogen unites with oxygen to form water, it gives a dim blue flame which is intensely hot. But compounds may be made by burning with other things besides oxygen. Hydrogen, for instance, burns with a pale green flame in the gas called chlorine, and produces what we call hydrochloric acid, which has the formula HCl. Our study of the compound common salt, or NaCl, will tell us exactly what HCl means. Then copper can similarly be burnt in sulphur vapor, and so can iron.

THE CURIOUS BEHAVIOR OF SOME COMPOUNDS IN HEAT AND LIGHT

Another very common way of forming compounds is by making one element turn out another from a compound, and take its place. For instance, we can form the compound water by acting upon the compound of some element with oxygen by means of hydrogen. The hydrogen turns out the other element and takes its place with the oxygen, forming the compound water; or, to take another instance, if we take an element like zinc, and add it to hydrochloric acid, it turns out the hydrogen and takes its place, and we have the new compound formed, zinc chloride—the chloride of zinc instead of the chloride of hydrogen.

Then we can often make compounds by simply heating other compounds. Often a very complicated compound will break up, when it is heated, into two or more compounds that are less complicated; or we may just drive away a certain proportion of one of the elements in the compound, and so we may get something new. For instance, if we heat the peculiar compound which has the formula H_2O_2, we drive away exactly half its oxygen, and that is one way of making our very old friend, the compound water. Indeed, if you want to keep a specimen of H_2O_2, you have to keep it cool and away from the light; nor must you let anything that likes oxygen get near it, or that thing will certainly help itself to half the oxygen of H_2O_2, and leave only H_2O behind.

HOW COMPOUNDS PLAY THE GAME OF EXCHANGING PARTNERS

One of the special uses of H_2O_2 and of some other things like it, is that they very readily give up oxygen to almost any sort of unpleasant stuff which we want to get rid of, perhaps because it has a bad smell, and so change it into something harmless.

You will say that, after all, there is plenty of oxygen in the air, and why should it be necessary to use H_2O_2 to give oxygen to things? The answer is that when oxygen leaves one of its compounds—and this is true of all the elements as well as oxygen—it is much more active and powerful than when it is in its ordinary state. This has been explained already.

Yet another way of making compounds is perhaps the commonest of all; and we must understand it. It has the rather long name of *double decomposition*, but is quite simple really. If we mix two compounds, it often happens that they exchange partners. That is all. Anyone who plays games knows what exchanging partners means; and when that happens in chemistry we call it double decomposition. Of this there are thousands of instances, as when we

take the two pairs, one made of oxygen and mercury, and the other of chlorine and hydrogen. They exchange partners, the mercury takes the chlorine, and the hydrogen takes the oxygen, so that we have mercury chloride and water. That is a good instance of a double decomposition, and it teaches us something.

THE PARTNERS THAT ARE FOND OF EACH OTHER COME TOGETHER IN THE GAME

For we may say in general that, whenever chemical changes like this occur, there is a certain bias, or tendency, in their direction. Some compounds are strongly united, and others weakly united; and the tendency always is to form the compounds that are strongly united. Do you not think that, in exchanging partners in a game, the people who are fondest of each other are very apt to get together? If you have not noticed that, I am sure I have.

Now, that is the rule in chemical changes, and especially in double decomposition. If the chemist knows what compounds are strong and what compounds are weak, if he knows which elements are specially fond of other elements, then he can usually fortell what will happen when he mixes two compounds. Of course, nothing may happen. The partners in the two compounds may be so pleased with each other, so to say, that they will not change. Indeed, a double decomposition will often go in one direction, but cannot be persuaded to go backwards.

HOW TWO CLEAR LIQUIDS MIX TOGETHER AND MAKE A BRIGHT COLOR

Now, in this instance we have given, we notice that water is one of the things that is made. We know that water is one of the strongest compounds in the world. Oxygen and hydrogen are never better pleased, so to say, than when they are together. This is a case where "three is company"—three atoms. Thus, in a double decomposition, if there is any chance of forming water, we may be quite certain that water will be formed, and that the other partners, whatever they are, will probably have to join company whether they are very fond of each other or do not care at all.

Another thing is to be noticed. As a rule, in a double decomposition, anything that is solid—that will not melt in water—is specially apt to be formed. If water is formed also, then this thing appears as something suspended in the water. After a time it settles to the bottom, and then, by pouring the water off or filtering, we can get the new thing by itself. So it is the commonest thing in the world for a chemist to take two clear liquids—each of which may be colorless, perhaps—add one to the other, and then, in an instant, there may appear perhaps a bright red or brilliant white cloud, which is the new thing formed by the double decomposition that occurred. In the case we have mentioned the mercury chloride is white, but cannot be dissolved in water. If we allow the water to evaporate, then we get the white salt by itself. It is an intensely poisonous but very valuable substance, and this is one of the ways of making it by double decomposition.

WHAT THE CHEMISTS FOUND IN LOOKING FOR SOMETHING TO MAKE GOLD

It very often happens, in double decomposition and in other cases, that a solid is produced in a fluid, and gradually falls to the bottom; and we have a special word for what happens then. We all know what a precipice is. It is a place where the land falls suddenly, and if a man, or anything else, falls over it we say that he was precipitated. Now, when a solid is formed in a fluid, and falls to the bottom, we always say that it is precipitated, although it usually falls very slowly, and sometimes does not fall at all, but hangs in the fluid; and the solid which forms and usually falls is called a precipitate.

It is a long and rather clumsy word, but it was used many centuries ago by the old founders of chemistry, when they were looking for the thing which should make us all young again, and for the other thing which was to turn everything it touched into gold. They did not find either of those things, but they noticed a great many facts, and named them, usually with rather fanciful names. One particular thing formed in the way we have described is called white precipitate. It is highly poisonous, but very useful to apply to the skin when little creatures that should not be there are living on it. It is poisonous to them, and that is what we want. Then there is red precipitate, and so on. After this, we shall understand what we mean when we say

that something is precipitated. Nowadays chemists often turn the same idea into English, and say instead that in certain chemical operations such and such a compound is thrown down or thrown out. "Thrown out" rather expresses the idea, as if the new compound were thrown out by the water which declined to hold and hide it, as it does when it dissolves a lump of sugar.

THE SIGNS USED BY CHEMISTS TO SHOW WHAT HAPPENS TO THE COMPOUNDS

Now, one of the special uses of formulas in chemistry is that they allow us to write, in a very short and neat way, an account of what happens when a chemical change goes on. This change is called a reaction. We say that, for instance, when hydrochloric acid is added to sodium carbonate, there is a reaction. Certain conditions must be present, of course. For instance, scarcely any chemical reaction will occur at the temperature of frozen air. Many chemical reactions require much heat to be used, and so on. These things cannot be expressed in the way we are now going to study, but that way does express what happens, and it does so exactly.

We know that the sign = means *equals*, and we know that the sign + means *added*. So if we write $2 + 3 = 5$, we call that an *equation*, for it states that certain things added together are equal to something else. Now, in rather the same way, it is possible to write a chemical equation; and in the study of chemistry all the world over these equations are used many times every day. The sign =, when used in a chemical equation, means that the things on the left of it are turned into the things written on the right of it when the change comes about.

THE STORY OF GREAT HAPPENINGS TOLD BY $CaCO_3 = CaO + CO_2$

These equations may be very simple or very complicated. Let us take a very simple one to start with. We all know what marble is, and we all know what chalk is. These two things, and many others, are made of calcium carbonate. The Latin name for chalk is *calx*, from which chemists have derived the name of *calcium* for the chief element in chalk. The letters for *calcium* are Ca. Now, the formula of calcium carbonate is $CaCO_3$. If this is heated, it is decomposed and split up into two new compounds. One of them is called quicklime; it has the formula CaO, which shows us that it is an oxide of calcium; the other substance that is formed is our old friend carbon dioxide, CO_2. Now all this can be said in a line of what we call a chemical equation:

$$CaCO_3 = CaO + CO_2$$

Now, the question in every case like this is whether the equation is a real one or a sham one, and that is easy to test. The "equation" $2+3=6$ is a sham one, for the very good reason that there is more on one side of it than is accounted for on the other side. In every chemical equation, as in every other kind of equation, we must be sure that everything stated on one side is fully accounted for, and no more, on the other side. If that is so, the equation is a real equation. It does not follow that the change which the equation describes happens, for something quite different may happen. But at least it might happen.

NOTHING COMES FROM NOTHING, AND NOTHING IS MADE INTO NOTHING

On the other hand, we know that if there is something on one side of what pretends to be an equation that is not accounted for on the other side, then certainly what that equation describes does not happen. If it did, it would mean either that some atoms came into existence out of nothing, or that some atoms were destroyed and made into nothing. Now we know that nothing comes from nothing, and that nothing is made into nothing. Everything must be accounted for, where it has gone to, and where it comes from. If we can account for it, we may or may not be right, but if we cannot do so, we are certainly wrong.

So we must look at our equation, and carefully count the atoms of various kinds, on one side and on the other, and we must see that they exactly correspond, both in number and in kind. It will not do if, in place of an oxygen atom on one side, there is a carbon atom on the other. There must be as many of each kind of atom on one side of the equation as on the other, or it is false. The true test whether we understand a

chemical reaction is whether we can write a true equation of it. As long as we fail to do this, we do not understand the reaction.

Now will you please count the equation given on previous page, and say whether it is true or false? You will find that there is one calcium atom on each side, one carbon atom on each side, and three oxygen atoms on each side. It is a true equation; it fully and truly describes what it is that happens when we heat marble or chalk; it accounts for all the atoms that are engaged, and for no more. Here is another equation:

$$C_3H_6O+H_3NO=C_3H_7NO+H_2O_2$$

It does not in the least matter whether these compounds exist, nor whether you know their names. But suppose they exist, I want to know whether that reaction happens. Will you please find out before you read any further?

I know the answer you have decided upon; but suppose, instead of H_2O_2 at the end of the equation, we wrote simply H_2O—that is to say, instead of hydrogen peroxide, simply water.

THE BIG 2 AND THE LITTLE 2 AND THE DIFFERENCE BETWEEN THEM

Now, is it possible that that reaction might happen? As a matter of fact, the one of these two that can happen does happen, and it is a simple reaction compared with some, which would take many lines of this book to write.

Now let us take an instance of an equation that describes a double decomposition, and we may as well take one that has been already mentioned.

All we need to know is that the letters for mercury are Hg. The Latin name for mercury is *hydrargyrum*, which simply means water-silver, for that is what it looks like. But we cannot take H for mercury, since that has been used up already for hydrogen, so we take Hg. Here is the equation:

$$HgO+2HCl=HgCl_2+H_2O.$$

This is the equation that describes what happens when hydrochloric acid is added to mercury oxide. The oxygen and the chlorine change partners, so that we get mercury chloride and hydrogen oxide, which is water. This equation, of course, you must test. There is something new about it not seen in any equation we have had yet, and this must be explained, because it has to occur in almost all chemical equations. The big 2 in the first half of the equation has not the same meaning as the little 2's which we are so familiar with in the case of water. The big 2 means that in order to make the equation true, we must take two molecules of hydrochloric acid to add one molecule of mercury oxide.

A SIMPLE RULE THAT HELPS US TO REMEMBER AND UNDERSTAND

That is so. We have to take the quantities of these two substances that the equation expresses if we want to get a complete result that changes the whole of both substances we start with. So, of course, it means that the big 2 applies to the whole of what is written after it, as if it were written 2(HCl), or H_2Cl_2. This means that on the left-hand side of the equation we have to reckon with *two* atoms of hydrogen and *two* atoms of chlorine. Remembering that, perhaps you will now test the equation and see whether it is a real one.

The simple rule to remember is that the little figures written after a letter mean so many atoms of what that letter stands for. If there is no figure after a letter, that means that it is just one atom—we do not take the trouble to write the figure 1. But a big figure written before the formula of a compound means that we are taking a molecule of that compound so many times over, and so, if we write $3Na_2CO_3$, we have really *six* atoms of Na, *three* of C, and *nine* of O to account for on the other side of the equation.

PRACTISE WRITING DOWN EQUATIONS FOR YOURSELF AND TESTING THEM

This is not really difficult, and it is quite necessary to understand. You can practise writing equations on a piece of paper and testing them. Take any letters you please, and imagine any kinds of compounds. Let us imagine one:

$$12C_7HO_8=4C_{20}H_2O_{22}+\text{What?}$$

Suppose that this happened, and that just one other compound were required to complete the equation, what would it be, and how many molecules of it would you require? After all, it is only a new kind of sum.

THE NEXT STORY OF THE EARTH BEGINS ON 1813.

THE FORBIDDEN ROOM

CONTINUED FROM 1534

THERE was once a magician who took the form of a beggar and went from house to house stealing all the prettiest girls, none of whom ever came back again.

One day he begged for scraps of food at the door of a man who had three very pretty daughters, and the eldest one gave him bread. When she was not looking he touched her arm, and against her will she found herself compelled to jump into his basket. Then he took her to his house in the middle of a thick forest, where everything was magnificent, and she had all that she could possibly desire.

After some days he told her that he was going on a journey, and handed to her the keys of the house, saying that she could go into all the rooms except one. If she entered that room, she would die. At the same time he gave her an egg, and told her to be very careful not to lose it.

No sooner was he out of sight, than, still holding the egg he had given her in her hand, she went all over the house, and found the rooms filled with lovely things. At last she came to the door of the forbidden room, and, after hesitating for a while, her curiosity got the better of her, and she went in. To her astonishment, she found there a number of girls imprisoned by the magician. They lay as if asleep, and, frightened by their stillness, she fled from the room and rushed away.

In her terror she dropped the egg. It did not break, but when she picked it up she found that it was smeared with red, and, in spite of all her attempts, she could not clean it.

A few hours later the man returned, and asked at once for the keys and the egg. When he saw the red mark on the egg, he knew that she had been into the forbidden room. Throwing her on the ground, he dragged her back into the secret chamber, and imprisoned her with the others.

He then set off again to the house where he had begged, and this time he captured the second daughter. She, too, yielded to curiosity, and met with the same fate as her sister.

The wizard then captured and brought away the remaining sister; but this one was very cunning, and when, in her turn, she received the keys and the egg before the man went out, she at once put away the egg carefully in a cupboard. Then she took the key and went into the forbidden room to see what it contained.

Here she was astonished to see the floor covered with girls fast asleep, among them her two sisters. But, being wiser than the others, she took care of the egg and kept it clean. When the wizard came home, she ran to him with the keys and the egg, and seeing that the egg was clean, he exclaimed, "You shall be my wife; for you have stood the test well."

But the magician was now no longer able to do as he liked, for his

bride had broken his power and was able to do with him whatever she would. So she went into the forbidden room and awakened the sleeping prisoners, who had been held bound by the wizard's spell. Then she said to him:

"Before I marry you, you must carry a basketful of gold to my parents."

Taking a very large basket, she put her

In her disguise, the magician's bride met the guests, who said, "Fairy bird, from whence do you stray?"

two sisters into it and covered them over with gold coins. Next she told the man to carry the basket, and not to stop anywhere, as she would certainly watch him from her little window. The man put the basket on his shoulder and started, but found it so heavy that he was ready to drop with fatigue. So he sat down to rest; but instantly a voice from the basket said, "I am watching from my little window." Thinking it was his future wife calling after him, he started up and struggled on. Every time he tried to rest, the same thing happened, and at last he reached the parents' house, where he left his basket. While he was on his journey his intended bride took a painted head, decorated it with flowers, and placed it at an upstairs window, as if it were someone looking out. Then she set free all the wizard's victims, and sent out invitations to the wedding. Next she covered herself with feathers, so that she looked like some queer bird, and no one could recognize her. After this she started from the house and met some of the guests, who said:

"Fairy bird, from whence do you stray?"
"I came from the fairy's home this day."
"And what has become of the young bride, say?"
"She has garnished the house all in and out,
And now at the window she's looking out."

When the wizard returned, he looked up and saw the head at the window, and, thinking it was his future wife, went into the house. At once the friends of the three sisters, who had come to revenge their wrongs, locked the doors, and set the house on fire. And that was the end of the wizard and his forbidden room.

THE STORY OF LADY ANNE GRIMSTON

IN a great house in Hertfordshire Lady Anne Grimston lay dying.

She was a proud and obstinate woman, who had enjoyed her riches, her lands and the society of her friends while she lived, and had cared nothing for the more important things which do not pass away. And she died as she had lived, with none of the comfort that comes to all good men and women when they leave their friends and pass out of this world.

She believed that when she had passed away from her friends, when her houses, and riches, and lands were gone, she herself, and the life that was in her, would be gone, too, gone for ever, utterly destroyed. Her friends tried to point out to her how terrible and impossible this was, how certain it was that she would live again, as the roses live again. Just as the trees and flowers in the field live again after their long sleep, so, said her friends to Lady Anne Grimston, she, too, would live again, and the life that was in her would never end.

But Lady Anne Grimston was proud and unbelieving, and she said to her friends, "I shall not live again. It is as unlikely that I shall live again as that a tree will grow out of my body." Lady Anne Grimston died, and was buried in a strong tomb made of marble —buried and forgotten. But not quite forgotten; for one day, many years after, the marble slab over her grave was found to have moved from its position. The builders fixed it firmly in its place again, and left it, thinking it quite secure.

Again the heavy marble slab tilted slightly on one side, and in the middle was a crack, with a tiny bunch of leaves bursting through. The crack was closed with cement and the slab put back again; but again the slab was lifted up, the crack opened wider than ever, and the thin trunk of a tree appeared. They repaired the crumbling tomb, and built around it tall iron railings to hold the masonry together; but the young tree made its way, breaking the masonry in two, destroying the walls of the tomb, and tearing the heavy iron railings out of the ground.

GREAT TREES GROWING OUT OF THE GRAVE OF LADY ANNE GRIMSTON IN TEWIN CHURCHYARD

And to-day, growing right from the heart of Lady Anne Grimston's grave, in Tewin churchyard, half an hour's ride from King's Cross Station, is one of the biggest trees in England, four trees growing from one root. The heavy iron railings are fast through the trunk of the tree and cannot be moved, the marble masonry of the tomb is shattered to pieces, and to-day Lady Anne Grimston's grave is a heap of broken stone and twisted iron bars.

THE MAN WHO MIGHT HAVE BEEN KING

William Tell, seen here with his little son, was arrested for refusing to bow to a tyrant set over the Swiss people by their Austrian conquerors. He was offered his freedom if he would shoot an arrow at an apple placed on the head of his little boy, which he did. Though arrested again, he escaped, killed the tyrant, and freed the country. They would have made him king, but he went back to his home in the mountains.

THE STORY OF BRAVE WILLIAM TELL

THE MAN WHO FACED A TYRANT

THERE walked one fair day across the market square of Altdorf, in Switzerland, as fine a looking man as one could wish to see. Tall and straight, broad and shapely, with ruddy, bearded face and proudly-held head, this man of the mountains strode with clean, swinging stride across the square, with a look of bright happiness in his eyes, and a cheerful word of greeting for his friends. Many turned to say, "There goes William Tell, the crossbowman of Bürglen."

This man, who was said to be the finest crossbowman in Switzerland, and the best handler of a boat on the storm-swept lake of Uri, lived quietly in a mountain cottage, with a wife who shared every thought of his heart, and children for whom it was his delight to work. He hunted deer in the mountains, and went fishing on the lake. His children never lacked good food and clothing. His home was trim and neat. There was no family in that district more firmly established in peace and contentment.

Tell had sold the pack of deerskins which he had brought with him to Altdorf. He was on his way now to buy winter clothing of warm wool for his children. He had money, enough and to spare, and he was in a mood of great happiness. In an hour or more he would be singing a song on the road to his mountain home. Suddenly he felt his arm seized, and found himself in the grip of an Austrian soldier. In another instant he was surrounded. The soldier who had seized his arm pointed to a pole with ducal cap on the top. "It is death not to bow to that cap, and you know it!" said the soldier.

A silence fell upon the whole square. People left off their trading and crowded round the group. A thing greater than trade was at stake now—a man's freedom, a nation's liberty. William Tell had flushed a deeper red. He brought his eyes from the cap on the pole to the soldier's face. "I have done nothing unlawful," he said slowly.

"You have insulted the majesty of the Duke!" said the soldier.

William Tell kept a steady eye. "Why," said he, "should a man show more reverence to an empty cap than to any empty cloak or a pair of hose?" At this there came from behind the soldiers the figure of the Governor of the district, the tyrant Gessler. It was this Gessler who, set over the once free Swiss by their conqueror and oppressor, the Duke of Austria, had trodden liberty under foot, had murdered and imprisoned all who stood against him, and, as a last barbarity, had declared that everyone who did not do homage to the badge of Austrian rule set up on the pole in their market-place should die. William Tell faced the Governor. He feared no man. No one could break his proud spirit. In his mountain he had brooded upon the shame of the slavery which enchained his country, and had already spoken with his friends of resistance. Never, never, would he do homage to the hated badge of the tyrant's mastery.

"So you would make a jest of the sign of majesty?" asked the Governor, approaching him, while the soldiers saluted. At that moment there came from the crowd a child's cry of "Father! Father!" The crowd turned about, opened out, and presently William Tell's little son, who had come without leave to the fair, was rushing to his father. The Governor caught the boy's arm. "Is this the brave traitor's son?" he asked.

"Hurt him not," said Tell. "He is my firstborn."

"Oh, I wont hurt him!" answered the terrible Gessler. "If any harm should come to him, it will not be by me, but—by you." A horrible smile lighted his eyes. "Here," said he to a soldier, "take the boy and tie him to the trunk of that linden-tree over there, and place an apple on his head."

"What is this for?" demanded Tell.

"I am told that you are called the crossbowman of Bürglen," replied the Governor, "and I should like you to give me an exhibition of your skill. Your life is forfeit. But I am in a merciful mood; I will give you a chance of redeeming it. Come, listen to me. If at this distance you can shoot an arrow so as to split the apple on the curls of your firstborn, I will let you go free. If not—if you miss the apple, or kill your child—I will execute you, here and now."

"Have you no mercy?" cried Tell, trembling with indignation. "And do you think I will attempt to save my own life at the risk of my son's?"

"I am doing you a favor," replied Gessler. "Think. By a lucky shot you may save your life, and go home!"

Tell held out a hand which was trembling. "How can a man who loves his son aim with a steady hand an inch above his temples? Ah, look at the child! My lord, look at him! He is no kin of yours; you know nothing of the pretty ways by which he has climbed into a father's heart, the innocence of his eyes, the beauty of his face! Am I to risk that life?"

Gessler laughed brutally. "Well, you either shoot an arrow, or die."

"Then I will die."

"And first your child shall have his neck wrung before your eyes!"

A blinding passion of indignation overswept the noble soul of the mountaineer. "Give me the bow," he said. "One thing in mercy I ask. Let the child's face be turned away from me. Let me not see his eyes fixed upon me."

A way was cleared between father and son. A dense multitude stood on either side. The boy, with his face to the tree, bound by ropes to its trunk, felt the apple weigh like lead upon his head. A dreadful silence fell upon the market square. William Tell chose two arrows. One he thrust in his girdle; one he fitted to his bow-string. Then for a moment he stood, a little bowed of shoulder, with his eyes downward; he was praying. You might have heard a leaf fall, so still was the place. Then Tell raised his head; his eyes were steady; his hands had become still; his face was like iron. He brought the crossbow to his shoulder and laid his eye to the feather of the shaft. *Twang!*

The arrow shot forward, and, as it were at the same moment, buried itself deep in the tree. The apple fell in equal parts on either side of the boy's head. A roar of cheering went up to heaven, and Gessler turned to Tell.

"A good shot, traitor!" he said cruelly. "But tell me, for what reason did you take two arrows?"

Tell laid his hands upon the arrow in his girdle. "If the first arrow had hurt my child," he said, "this one by now would be through your heart!"

"Oh! So I run in danger of my life?" said the Governor. "But I will keep the pledge I gave you. You shall not die. I will give you your life. But the rest of that life you will spend in the dungeons of my castle, and your bow-string will not then be a danger to me."

At this Tell was seized again, and rushed by the soldiers through the scowling mob to the quay, where the Governor's ship was moored. But it chanced that as the ship crossed the lake of Uri a storm arose, savage and wild, and it seemed as if everyone would be drowned. The Austrians could not manage the vessel, and began to abandon hope. In their panic they remembered that Tell was reputed the best sailor in that part of the world, and spoke to the Governor. "Loose him," said Gessler, "and let him save us." So Tell took the helm, and under his guidance the little ship soon righted herself. But as he headed her for the shore he was thinking, not of Gessler and the Austrian soldiers, but of freedom—freedom for himself and for Switzerland. He would free himself and save his country.

He brought the ship close to a rock that jutted out from the coast, and then, as it shot past, he sprang suddenly upon the rock, and left the Austrians to save themselves. Swift of foot, he scaled the rocks, climbed the cliff, and made his way across the mountains to a place on the road, which Gessler, if he saved himself, would have to pass. Here he lay concealed amongst the bushes, with an arrow fitted to his bow-string, his heart set on delivering Switzerland from the tyrant. As he waited, darkness fell among the mountains. Presently there came to him the tramp of feet. "And if I live to return to Altdorf," Gessler was saying, "I swear I will destroy the whole brood of this traitor Tell, mother and children, all in the same hour!"

"You shall never return!" said Tell to himself. And, as the soldiers went marching on, he let fly the arrow, and Gessler dropped dead in the dust.

William Tell inspired the rising of the Swiss people, which led to the overthrow of the Austrians and made Switzerland a free country.

They would have made him king, but he shook his head, and went back to his home among the mountains, which was more to him than many palaces.

LITTLE STORIES ABOUT FLOWERS

Almost every flower has a story, just as almost every place has a legend. They are "made up," perhaps, as the legends are, but they are often very beautiful.

THE CORNFLOWER

QUEEN LOUISA OF PRUSSIA was a brave, beautiful lady. The great Emperor Napoleon came and conquered her country, and oppressed her people, and she struggled bravely against him.

At last, however, Berlin was captured by the enemy, and she barely managed to escape with her little children and hide in a grain-field. Her children were frightened, and began to cry, and Queen Louisa was afraid that someone might hear them. So she took some of the blue cornflowers and twined the blossoms into wreaths and crowns for them, and in this way made the children forget their sorrow.

One of her children was named Wilhelm, and he afterwards conquered Napoleon's nephew, and was made the first German Emperor, and he took as his emblem the blue cornflower. Now all the German people wear it on festival days, as the emblem of German unity, and as a souvenir of their brave Queen Louisa of Prussia.

THE ENCHANTED THORN

ONE of the thorn-trees at Newlands Corner, in Surrey, is enchanted. Some maidens who danced around it one summer night were carried off by the fairies and never seen again. But a few years later two shepherds were sitting there, when the thorns were white with blossom, and one of them said:

"We'll see if this thorn is really enchanted. I'll dance round it, and you sit and watch what happens."

Instead of dancing in the ordinary way about the tree, however, he danced round it backwards. When he had finished, the earth opened, and a green table came up. On the table were delicate dishes of meat and fish.

"Don't touch it; it is fairy food!" said one of the shepherd boys.

But his daring companion feasted to his heart's content, and the table then sank into the earth. He became one of the richest farmers in England, for the food was lucky food, but his companion to the end of his life remained a shepherd.

THE CHRYSANTHEMUM

IN the Black Forest lived a peasant named Hermann. Going home one Christmas Eve, he saw a little boy lying in the snow. He carried him to his wife and children, who, in their pity, gladly shared with him their little feast.

All night the Guest remained in the hut, and in the morning revealed Himself as the Christ-child, and vanished. When Hermann next passed the place where he had found the Child, wonderful flowers were growing out of the snow. Gathering a handful, he gave them to his wife, who called them chrysanthemums, meaning Christ-flowers, or, more correctly, gold-flowers. Ever after this on Christmas Eve a part of the feast in Hermann's house was set aside for some poor child, in memory of their Guest.

THE ROSE OF JERICHO

THE rose of Jericho is also known as the Resurrection flower, for it is supposed to have the property of dying and coming to life again. Its origin is described in a very pretty legend.

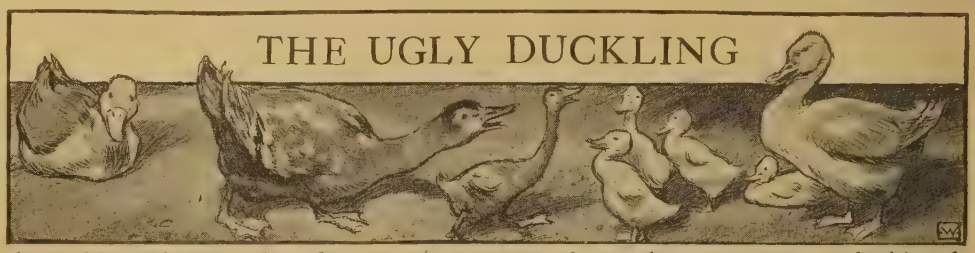
When the infant Jesus fled from Bethlehem with His mother Mary and Joseph, to avoid the massacre of all the young children by King Herod, the party are said to have crossed the plains of Jericho. When Mary alighted from the ass on which she was riding, this little flower sprang up at her feet to greet the infant Savior whom she carried in her arms.

Flowers are said to have thus sprung up at all the places where the Holy Child rested.

All through the Savior's life on earth the little rose of Jericho continued to flourish, but when He died upon the Cross all these flowers withered and died away at the same time. But three days later, our Lord rose again from the tomb, and at the same time the roses of Jericho came to life, and sprang up and blossomed all over the plain as an emblem of the joy of the earth because Christ was risen.

And because of these happenings, the rose of Jericho has ever since borne also the name of the Resurrection flower.

THE UGLY DUCKLING



AN old Mother Duck, who was very proud of her handsome family, was much disappointed when a little one was hatched who was so ugly that everybody called him the Ugly Duckling.

"I never imagined," she said to a friend who came to visit her, "that I should ever have such an ugly child. Just look at the others, how pretty they are and how gracefully they move!"

Soon the ducklings grew old enough to have their first swimming lesson.

"Quack, quack!" cried the Mother Duck, and out they all came, as fine a brood of ducklings as any mother could wish to see. And behind them came the Ugly Duckling, alone and forlorn.

"Do you not see your young brother?" said the Mother Duck.

"He can't be our brother," they replied scornfully. "He is so ugly that we can't bear to look at him."

But when they found that he took to the water like a brave young duck should, and beat them all at their games and races, they were jealous of him, and angry that one so inferior in appearance should in any way excel.

One day the Mother Duck took her children to visit some friends in a neighboring farmyard. They had not been there long before the Ugly Duckling found everybody staring at him, and one old duck even flew at him and bit him on the neck.

"You are not like the rest of us," he said. "You are so big and ugly. Why do you come here?"

"Let him alone," said the Mother Duck. "He is not pretty like my other children, but he is good-natured, and he swims better than any of them."

But when the mother's back was turned, the Ugly Duckling had a bad time of it. They all made fun of him, and gave him sharp pecks.

"They all hate me because I am ugly," sighed the Ugly Duckling, "and it is through no fault of mine. I am evidently not wanted. I shall go away."

And so when no one was looking he stole away. On and on he went until he came to a great moor, where he saw a number of wild ducks who came to have a look at the stranger.

"How do you do?" said the Ugly Duckling politely.

But they stared at him for some time without answering, and then one said:

"How ugly you are!" And then they all began to laugh. But just at that moment there came a sound which terrified the poor duckling.

"Pop, pop!" went a gun, and down dropped the wild ducks one by one.

The smoke from the guns blew across the water and choked him, and as it faded away in the air the duckling was terrified to see a huge dog dash into the water and come swimming towards him. He was too frightened to move, but to his surprize the animal, with a sniff, passed him and left him trembling from head to foot with fright.

"I am so ugly that even a dog cannot bear to look at me," he thought and he shivered and dared not move till the sun had gone down, lest other strange dangers should come upon him.

When morning dawned he caught sight of a little cottage that lay close by. Perhaps it might offer shelter for the poor lost duckling, who felt so helpless in a strange world.

He went up to the door and peeped in. An old woman stood by the hearth, and near by crouched a cat and a hen.

"Perhaps they will not notice how ugly I am, and will let me stay," thought the duckling. And he crept in and waited just inside the doorway.

The cat saw him first, and she began to purr loudly, and the old woman looked round.

The Ugly Duckling held his breath for fear that she should turn him out. But a smile spread over her face.

"How fortunate I am," she exclaimed; "now I shall have some duck's eggs!"

But the duckling did not present her with any eggs, and after a time the cat and the hen began to quarrel with him.

"I don't know of what use you are in the world," said the hen disdainfully. "You cannot lay eggs like I can; you cannot even purr like the cat, and nobody could call you handsome."

"I think I had better go, before they turn me away," sighed the poor duckling, "but where to go I cannot think."

And so he left the cottage and returned to the water, feeling even more lonely and helpless than before.

That evening at sunset there came out of the bushes a flock of birds, so beautiful and so white that the Ugly Duckling gazed at them in astonishment. They were swans. It was the first time that he had ever seen a swan and he thought that he had never seen anything so beautiful. They uttered strange cries as they passed, and for some minutes the duckling watched them, admiring their beauty with sad, half-envious feeling.

"How glorious to be so beautiful!" he thought.

But by and by came the winter, with the cold and the ice, and the poor duckling, cold and often hungry, longed for the home that he had left, for, bad as things had seemed, they were far worse now.

Sometimes the air was so cold that he was obliged to keep swimming about to prevent the water from freezing.

Once he was so tired and stiff with the cold that he could scarcely move, and then the pond froze around him, and he would have died if a farmer, who was passing, had not broken the ice with his stick, and rescued him.

The farmer took him home, and warmed and fed him, and the Ugly Duckling thought at last he was among friends. But in the afternoon, when the children came home from school, they ran towards him with cries of joy, and the duckling, thinking they meant to do him harm, flew up, and in his terror fluttered into the meal-tub, scattering the meal far and wide. This made the farmer's wife so angry that she picked up a stick to beat him. But luckily he saw her in time to escape.

Once again the duckling was homeless, and all through the winter he suffered from cold and hunger, until at last came the beautiful spring, with soft, gentle breezes and warm sunshine.

The old woman looked round and a smile spread over her face. "How fortunate I am!" she said.

"This is good!" said the duckling. "It makes me feel quite strong."

And on he went until he came to a pond. The pond was as smooth and as clear as a mirror, and in passing the Ugly Duckling looked down at his reflection. He was startled. Surely something was wrong! He looked again, and then he gazed all round, but no creature was in sight. What could it mean? Instead of a big, ugly duckling he saw a tall, graceful swan, as beautiful as the birds he had once seen. What had happened? Could it be that he, the Ugly Duckling, had changed into a beautiful swan?

He looked up, and there he saw, gliding towards him, a number of these beautiful creatures. They greeted him politely, and called him brother. "Come with us," they cried. "You are such a fine fellow, we would have you join us."

And then, lifting up his head, and quivering with excitement and joy, the Ugly Duckling, who no longer deserved his name, proudly followed his fellow swans, with whom he lived happily ever after.

THE STORY OF THE SLEEPING BEAUTY

ONCE upon a time all the fairies of the country were invited to the christening of a little baby Princess. Seven fairies came, and they acted as godmothers; and a feast was held in their honor. Just as the feast began an ugly old fairy appeared. Nobody had seen her for fifty years, and, thinking that she had left the country, the King and Queen had not troubled to invite her. This made her very angry, and as she sat down she muttered:

"Before I leave this place I will turn all their joy to sorrow."

Happily, the youngest fairy overheard the threat, and slipped away and hid herself behind a curtain.

When the feast was ended the other fairy godmothers came to the little Princess and gave her their christening gifts. The first fairy bestowed on her the gift of angelic beauty; the second, the gift of angelic goodness; the third gave her the gift of genius; the fourth, the gift of exquisite gracefulness; the fifth endowed her with the utmost sweetness of voice, and the last blessed her with every other gift.

"Hold! See, your gifts are useless!" cried the ugly old fairy. "For I give your godchild the gift of being pricked by a spindle, and of dying from the wound."

The King and Queen began to weep. But the youngest fairy sprang from behind the curtains and said:

"Do not weep, my dear King and Queen. The Princess shall not perish. Yet I cannot change entirely the spell which an older fairy has cast upon her. She will be pricked by a spindle. Yes! But instead of dying she will only fall into a sleep lasting a hundred years, and from that sleep she will be awakened by a kiss."

At once the King made a law forbidding everybody to use a spindle, and the Princess never saw one until she was sixteen years of age. Then, when climbing about one of her father's castles in the country, she came to a garret, and found there a simple old serving-woman spinning flax with a spindle and distaff. The Princess took up the spindle to look at it, the point ran into her hand, and she fell down in a deep sleep. The King and Queen summoned all their doctors,

The Prince strode through the castle gates and found the courtyard covered with horses and soldiers. And over all brooded an awful silence.

but none of them could awaken the Princess. In the meantime the youngest fairy arrived. She bade the King and Queen return to their palace, and leave all their courtiers in the castle. Then she dressed the Princess in a lovely robe and laid her in a golden chamber, and cast a spell upon every living thing in the place. A high, dense thicket of briers, thorns, and brambles at once sprang up around it.

Many persons lost their lives in trying to force a passage through the trees, and at last no one dared to approach it. The King and Queen died without leaving an heir, and a new line of kings began to reign, and in the wars and tumults of a hundred years the story of the Sleeping Princess was forgotten. At the end of that time the son of one of the new kings lost his way while out hunting, and wandered until he came to the Enchanted Castle. He asked who lived in this strange, lonely place. Some replied that it was the haunt of witches; others said it was the dwelling-place of a terrible ogre.

The Prince did not fear danger. He tied his horse to a tree, and, sword in hand, made his way to the castle.

The Prince opened the door of the Golden Chamber. In the middle stood a great bed, and on it lay a young Princess.

He entered the wood, and the briers and thorns and great trees bent aside to let him pass, and he strode on through the gate of the castle. He found it a place of strange death. The courtyard was covered with the bodies of horses and dogs and soldiers. In the corridors lay waiting-maids and pages, serving-men and messengers, and in the rooms beautiful ladies were stretched beside tall knights and gallant courtiers.

The Prince trembled, but he did not turn back. Still striding on, he opened the door of the Golden Chamber, and there he saw a wonderful sight. In the middle of the chamber stood a great bed hung with rich curtains, and on the bed was a young Princess of angelic loveliness. Surely she lived? He leaned over the Sleeping Beauty to see if she breathed, and touched her lips with his. The Princess opened her eyes.

"Is that you, my Prince?" she said. "I have been waiting a long, long time."

They began to tell each other the story of their adventures, but they were soon interrupted. For every living thing in the castle had awakened with the Princess. The dogs barked, the cocks crew, and the soldiers took up their arms. The messengers ran along the corridors with messages given to them a hundred years ago, and upset the trays of the waiting-maids. The courtiers made love to the beautiful ladies, and the maid of honor entered the Golden Chamber and said the dinner cooked a hundred years ago was ready.

Soon after they went to a little chapel in the Enchanted Castle, where they were married, and then set out for the palace of the King, where they were welcomed with wonder and joy.

THE STORY OF THE GOLDEN APPLE

ONE of the goddesses was so mischievous and caused so much trouble that she was named Discord, and Jupiter, king of the gods, drove her from his kingdom. This made her so angry that she determined to be revenged.

At a grand wedding that took place on the earth, when all the goddesses except Discord were present, Discord threw in a golden apple, on which was written, "To the Fairest." Discord knew that this would cause great jealousy; and so it did, for each of the goddesses claimed that she was the most beautiful, and ought, therefore, to have the prize.

At last Juno, Minerva, and Venus were chosen as the most beautiful. There was only one prize, however, and everyone was so afraid of offending these three powerful goddesses that they dared not decide which of the three should have the apple.

It was arranged that a young shepherd named Paris should make the choice, and each of the three goddesses offered Paris a precious gift if he would award her the prize. Juno offered him a kingdom; Minerva offered him great success in battle; Venus said she would give him the most beautiful woman in the world for his wife.

Paris chose Venus as the fairest. Some say that Venus was chosen because of her famous girdle, which gave to anybody who wore it great beauty and grace. Others say that Paris chose Venus because she promised him the most beautiful wife.

Paris was the son of the King and Queen of Troy, who had cast him off when a baby, but had now called him back to his home. He never forgot Venus's promise, and when he was a brave warrior he heard of the great beauty of Helen, and said to himself, "This is the woman Venus promised me."

So Paris assembled his ships and men, and sailed to the land where Helen lived. There he found Helen, and stole her from her husband and took her back to Troy. Helen's husband, Menelaus, came to Troy with all his princes to fetch Helen away, and for years a terrible war was fought between them. In the end Paris was killed, and Menelaus carried Helen back to her own home in Sparta.

THE STORY OF THE MAGIC CARPET

A SULTAN of India had three handsome sons, and they all fell in love with their pretty cousin, Princess Nourounnihar. One day their father called them together and said:

"You know how fond I am of curious objects? Well, I will grant the hand of the Princess to him who brings me the most wonderful thing."

After arranging to meet at an inn at the end of the year, the three brothers set out on their travels.

Prince Houssain, the eldest, went to Bisnagar, where he saw a Crier offering a carpet for forty purses of gold.

"That's a lot of money for a carpet," he said.

"No, it isn't," said the Crier. "Just sit on it, and wish yourself in some other place."

Prince Houssain sat on the carpet, and wished himself in his house, and, lo! he found himself in his bedroom. So he returned to the Crier, and gave him forty purses of gold for the carpet.

"I'm sure I shall win Nourounnihar with the carpet," he said.

He then wished himself in the inn where he had arranged to meet his brothers, and there waited for them.

Prince Ali, the second brother, went to Shiraz, where he saw a Crier offering a plain ivory tube for forty purses of gold.

"That's a lot of money for a tube," he said.

"No, it isn't," said the Crier. "Just look through it, and wish to see somebody."

Prince Ali looked through it, and wished to see the Princess, and, lo! he saw her sitting with her maids-of-honor in his father's palace. So he gave the Crier forty purses of gold, saying:

"I'm sure I shall win Nourounnihar with this tube."

He hastened to the inn, and there he and Houssain waited for Ahmed.

Prince Ahmed had gone to Samarcand. There he met a Crier who offered him an apple for forty purses of gold.

"That's a lot of money for an apple," he said.

"No, it isn't," said the Crier. "Just let the man who is dying in the next street smell the apple."

The Prince did so, and the dying man at once recovered his health. After paying the forty purses of gold, Prince Ahmed hastened to the inn and showed his brothers his apple, and they showed him their carpet and tube.

"It's difficult to say which is the most wonderful," said Prince Houssain. "Lend me your tube, Ali."

Houssain, looking through the magic tube, saw the Princess. She lay on her bed dying. The brothers jumped on the magic carpet, which carried them to the castle, and Prince Ahmed's magic apple saved her life.

Houssain looked through it, and wished to see Princess Nourounnihar.

"Heavens!" he cried. "What do I see? She is lying pale and motionless on a bed, and her maids are weeping. Oh, she's dying!"

"Quick, jump on the carpet!" said Prince Ahmed. They all jumped on it, and wished themselves in the Princess's bedroom. When they got there Prince Ahmed let her smell his apple, and she regained perfect health.

"Now, which of us has won Nourounnihar?" said the brothers.

"You all had an equal share in curing her," said the Sultan. "I'll tell you how to settle the matter. Take a bow and arrow each, and go into the great plain outside the city. He who shoots his arrow farthest shall marry the Princess."

Crowds came to watch the contest. Houssain sent his arrow a good way: Ali sent his still farther; Prince Ahmed shot so well that his arrow went out of sight! Nobody, however, could find it, so the Sultan decided that Ali had won Nourounnihar.

Prince Ahmed did not grieve long for his pretty cousin. What troubled him was the way in which his arrow had disappeared. He wandered for weeks about the plain seeking it, and at last found the palace of fairy Pari-Banou.

It was Pari-Banou who had sent the Criers with the magic carpet and the enchanted tube and the fairy apple. But she did not want Prince Ahmed to marry Nourounnihar, so she had caught up his arrow and carried it away. She wanted to marry him herself. Ahmed fell deeply in love with her, and married her, and with her help he became the Sultan of India.

THE NEXT STORIES BEGIN ON PAGE 1807.

THE SPLENDOR OF TRAVELING IN INDIA

The native rulers of India are the owners of the most wonderful jewels in the world. Their clothes and property are most magnificent. In this picture we see the present King and Queen, during a visit to India, riding on elephants decked with brilliant trappings. Many of our richly-colored carpets come from India.

Humayun

Native Soldiers of India

Shah Jehan

Akbar Khan

Aurungzebe

HOW INDIA BECAME AN EMPIRE

CONTINUED FROM 1638

THE story of India begins a long, long time before the story of England. For the first person who wrote down anything about England was Julius Cæsar, and that was only about fifty years before Christ was born—not quite two thousand years ago. But we know something about the people in India two thousand years before that. It was before Moses led the children of Israel out of Egypt, before even Abraham was born, that a people who spoke an Aryan language conquered the northern part of India. Learned people have found out that the languages which are spoken in Europe have grown up by degrees from one original language which was spoken ages ago by the ancestors of all these peoples. All the languages which have grown up from that one are called Aryan; so because the people who conquered India more than four thousand years ago spoke an Aryan language, we know that they came from the same stock as the races of Europe.

Now, the races who peopled India before talked quite a different kind of language. When the Aryans came into India through the mountain passes of the north-west, they did not destroy these people utterly, but made some of them servants or slaves; while the rest fled before them into the hilly country, which was more difficult to conquer than the great plains, just as the Britons in England were driven into the hills of Wales by the Angles and Saxons. The Aryans made themselves lords of all the rich lands of Hindustan, keeping many of the old inhabitants as slaves, hewers of wood, and drawers of water, like the children of Gibeon. That is how those four castes grew up of which we read on page 1636. Three of these were the castes of the Aryan conquerors, which included the Brahmins, to whom belonged the priests and the men of learning, the warriors, who were called Rajputs, and those people who followed employments which were held less honorable than these. The fourth caste consisted of the conquered people, who were accounted altogether contemptible.

Moreover, by degrees the Aryans made conquest of most part even of the hill countries, yet not so completely as in the great river basins of the Indus and the Ganges; so that instead of making the people slaves, they became mixed with them. That is why in the south there are far fewer Brahmins or Rajputs of pure blood than in the country to the north.

Because it was no easy matter for invaders to make their way into India, great kingdoms grew up in Hindustan

and in the Deccan, which had little enough to do with the world beyond the mountain barrier, their people knowing hardly anything of the great empires of Babylon and Assyria and Egypt.

How the Persians and the Greeks came down upon India

Long before Homer sang the tale of the fall of Troy, long before Romulus raised the first earthen rampart of Rome, Indian singers were telling the great deeds of their heroes, and Indian law-givers were shaping the laws of the Hindus. This we know, because their poems and their law books have come down to our own time, and learned men study them even to this day. Of their law-givers, the most famous is Manu.

Now, it would seem that when the Persian Empire was at its mightiest, just before King Darius made war upon the Greeks, the Persians made their way into India, and caused the kings of the Punjab—which means the land of the Five Rivers that flow into the Indus—to pay tribute; so that strange tales of the Indians came to the Greeks, of which this at least was true—that they would not eat flesh. But it was not till another hundred and fifty years had passed that the Greeks themselves were led by the mighty conqueror, Alexander the Great, through the great mountain passes. When they came into the Punjab, they were met in battle by the valiant Indian prince who was called Porus; though it would seem that this was not his own name, but a title borne by all those princes, just as all the kings of Egypt were called Pharaoh. In that battle, Porus was overthrown, so that Alexander made himself lord of all the Punjab; but because Porus was a wise man and valiant, Alexander made friends with him, and gave him back his kingdom, though he was still subject to the Greeks.

How Alexander's empire broke up and a great ruler rose in India

Some few of the Greeks abode in the Punjab, for some of their coins and their carvings have been found there; but after the empire of Alexander was divided, the veil fell again between the East and the West, and the nations of India went their own way as before. Moreover, it was only the peoples of the Punjab that were ever reached even by the Greeks. In those days there arose in Hindustan a very great ruler whose name was Asoka, whose fame for justice and mercy was spread over all India. He became lord of nearly all Hindustan, and even far away south in the Deccan his name was revered. Moreover, under his rule the doctrines of the great teacher, whom men for the most part call Buddha, but who had many names, were spread abroad, and many Buddhist temples arose. But of Buddha himself, who lived long before Asoka, we read in another place.

Now, for nearly a thousand years there is little more that need be told, except that men say that there were disciples of Jesus who made their way to India and preached the Gospel there; yet there were but few who believed. And again the teaching of Buddhism became corrupt, and the old religion took its place again, though this, too, had become changed and corrupt. This is the religion called Hinduism, which is followed by three-fourths of the people of India even to this day.

How Mussulman conquerors poured into Hindustan and set up kingdoms

Then there came a change, for when Mahomet had begun to teach the new faith which is called Islam, his successors set forth to compel all men either to become Mussulmans themselves, or the subjects of Mussulmans; and before long some of the Arabs, or Saracens, invaded India. However, it was not till Mahomet had been dead for nearly four hundred years—a thousand years after the birth of Christ—that Mussulman conquerors began to pour into India at the head of great armies, and to set up kingdoms in Hindustan, where Mussulman kings, with armies of Mussulmans, ruled over Hindu subjects. The first of these was called Mahmud of Ghazni, who conquered all the north of Hindustan with soldiers from Afghanistan beyond the mountains. And after this there were many Afghan and Pathan rulers, and Turks also, who reigned at Delhi, and others who set up kingdoms in the south, whom the Hindus hated as foreign conquerors; but because the Mussulmans were for the most part soldiers, they generally won the mastery.

At last, when Henry VIII. was King of England, Hindustan was invaded by Babar, founder of the Mogul Empire. So valiant and daring a warrior was he,

THE OLD AND NEW RULERS OF INDIA

This picture shows an English ambassador's first visit to a ruler of India. England first went to India by sea, and at the time of the rise of England's sea power, Elizabeth sent Sir John Mildenhall in 1599 to Akbar, the Great Mogul, to apply for trading privileges for a company to whom she wished to grant a charter.

This picture helps us to understand the vast change that has come over India. For 250 years British influence grew in India, but the country was still under the sway of native rulers until near our own time. To-day the King of England is Emperor of India, too; and in India King George V. is called Emperor George. Many years ago the late King Edward VII. visited India when he was Prince of Wales, and this picture shows his meeting with some of the native princes of India, who are now loyal to the Crown.

that with an army of twelve thousand men he overthrew the greatest kings of Hindustan, both Mussulmans and Hindus.

THE FOUNDING OF THE MOGUL EMPIRE, AND THE GREAT KING AKBAR

After him, his son, Humayun, had troublous times, and was driven out of the land, but had almost made himself king again when he died. But Humayun's son Akbar was one of the most famous and the greatest of all kings, for he was not only so great a warrior that he brought all Hindustan under his sway from the mountains on the west to the ocean on the east, but his rule also was exceedingly wise. He did not seek, as most kings did in India, to rule by the sword and oppress the people, but resolved to extend equal justice to all, whether Hindus or Mussulmans. He began to rule two years before Queen Elizabeth, and his reign lasted for fifty years, so that he outlived her for a little time; and when he died he left a greater empire, stronger and better governed, than India had known since the days of Asoka.

In his days, and in those of his son Jehan Gir, there came to India travelers from Europe, who brought home wonderful tales of the splendor of the court of the Great Mogul. There even came to Jehan Gir an ambassador from King James I., Sir Thomas Roe, seeking his friendship. But Jehan Gir brought little good to India, for he cared only for his own pleasures, and not for the good of the people over whom he ruled. A much better emperor was his son, Shah Jehan, who built the famous Taj Mahal as a memorial of the wife he loved, as we have read on page 1637.

HOW THE RULE OF INDIA PASSED INTO THE HANDS OF THE BRITISH

After him, his son Aurungzebe ruled for nearly fifty years, and strove to bring all India under his sway, overthrowing the great kingdoms that were still in the Deccan; yet thereby he wrought the ruin of the empire, since it became too large to be held under control; so it had to be divided into great provinces. And after his day the ruler of each province cared little enough for the Great Mogul at Delhi, but went each his own way as if he had been an independent king under no control.

And so it fell out that the lordship of India passed away both from Hindus and Mussulmans, who were somewhat akin in spite of all their differences, into the hands of the British, who were not akin at all in race or manners or religion, though they were descended from the same stock from which the Brahmins and Rajputs had sprung more than four thousand years ago.

Just before Babar conquered Hindustan, the Portuguese had found that they could sail to India round the south of Africa; and they got possession of some harbors on the Persian Gulf, and on the coast of India, and in the islands to the south-east, and began to trade there. Then, a hundred years later, King Philip of Spain made himself King of Portugal; and since he was at war with the English and the Dutch, both of them were ready to try and get all his trade into their own hands. So just before Queen Elizabeth died, the English and Dutch each set up a company to trade with the Indies.

THE FACTORIES WHICH BROUGHT ABOUT THE NEW TIMES IN INDIA

Then the English persuaded first one and then another of the native rulers, who were the subjects of the Great Mogul, to let them set up a trading station, which was called a "factory," at Surat, and at Madras, and at Calcutta. When Portugal freed herself from Spain, King Charles II. married a Portuguese princess, and the Portuguese gave him Bombay, of which city they had gained possession in the old days. The French, too, following the example of the English, got permission to set up factories at Pondicherry, which is not far from Madras, and at Chandernagore, which is not far from Calcutta. All of which things befell while the Great Moguls were still mighty, before Aurungzebe died.

Then, just when the Mogul Empire was breaking up into a number of provinces, which were really independent kingdoms, there arose a great rivalry between the British and the French, each of them seeking to win favor with the native princes, so that they might secure all the best of the trade, and shut the others out. As the disorder grew greater within the empire of the Moguls, and as it also seemed likely that Great Britain and France would go to war with each other over quarrels that they had

NATIVES OF INDIA AND THEIR RULERS

A YOUNG RAJAH, OR PRINCE, OF INDIA

A MAHARAJAH, OR GREAT PRINCE, OF INDIA

A MOHAMMEDAN AT PRAYERS

A FARMER AND A WARRIOR

There are many kinds of people in India, and the hill peoples differ widely from the people of the lowlands. The rulers lived in great magnificence and wielded great power before the British ruled the country. Their costumes, and those of the people, are very picturesque, and a man's rank or occupation is indicated by his dress.

in other parts of the world, a very clever Frenchman in India, whose name was François Dupleix, thought that he might manage to turn the British out.

THE FRENCHMAN WHO TRIED TO CONQUER INDIA FOR FRANCE

Nobody thought about conquering India, but Dupleix thought that if the British were out of the way, the French would be able to make themselves so useful to anyone they chose to help in the quarrels that were likely to arise more and more frequently among the native rulers, that they would soon be able to get very nearly anything they might ask for. He was the more sure of this, because he saw that French troops could fight much better than the native armies, and he thought that if native soldiers were trained and commanded by French officers they would be nearly as good as French troops.

So when the expected war between Great Britain and France broke out, Dupleix attacked the British at Madras and captured it. Then the ruler of that part of India, who was called the Nawab of the Carnatic, wanted to turn the French out of Madras, and Dupleix had the chance of showing that his idea about training native troops under French officers was right. He did it, too, for a mere handful of men scattered quite a large army which the Nawab sent against them. The French had to give Madras back after all, because when the war came to an end both sides gave back what they had taken; but then, as Dupleix had expected, native rulers began to quarrel, and one side made haste to ask the French to help them. Then of course the British took the other side in the quarrel.

THE CLERK WHO DROVE THE FRENCH ARMY OUT OF INDIA

This time the fortune of war went against the French, for while the French and their allies seemed to be getting the better of the allies of the British, a daring young officer named Robert Clive —who had joined the Army at the end of the last fighting, having been only a clerk before that—was sent with a few hundred sepoys, or native soldiers, and a very few British volunteers to attack the enemy's capital, which was called Arcot. Clive captured Arcot, and then, with his few men, defended it so stoutly against a great army that presently he put that army to utter rout. After that the British and their allies got the best of it. Although peace was again made in India, before long yet another war broke out between Great Britain and France, and this time the British beat the French so thoroughly that they had to promise not to keep soldiers in India any more.

So instead of the French getting rid of the British, as Dupleix had hoped, the British got rid of the French, and could carry out the plans which Dupleix had meant the French to carry out for themselves. The French had taught the British how to make themselves powerful in India, and the British had learned the lesson.

Before the French had been quite got rid of, another thing happened, which made the British masters of the very important province of Bengal.

THE CRUEL RULER WHO SHUT UP PEOPLE IN THE BLACK HOLE OF CALCUTTA

The ruler of Bengal, like the ruler of the Carnatic, was called the Nawab; and his name was Surajah Dowlah. He was very silly and very cruel. Because he was offended with something that the British people at Calcutta had done, he seized nearly a hundred and fifty of them, and shut them all up on a stifling hot night in a little room with only a tiny window, ever since called the Black Hole of Calcutta; and the result was that nearly all of them were dead before morning. Of course the British at Madras determined to punish the Nawab of Bengal for his crime; and Clive was sent off by sea with a few troops, and some ships of the Navy which happened to be at hand. He very soon routed the Nawab's soldiers, and took Calcutta again; and then a number of the native chiefs who had resolved to get rid of Surajah Dowlah asked Clive to help them.

Clive then marched against the Nawab with an army of three thousand men, and the Nawab marched against him with fifty thousand. At the famous battle of Plassey the three thousand routed the fifty thousand; Surajah Dowlah was killed; and then all the native chiefs made submission to Clive. Although he appointed a new Nawab, he had himself to become the real ruler of Bengal, and after a little

ELEPHANTS DRINKING IN THE SACRED GANGES

Here we see native trainers bringing their elephants to drink. The elephant, though strong enough to crush out a man's life with one of its huge feet, is very gentle and affectionate when treated kindly. A well-trained elephant will obey the slightest word or gesture of its driver, or mahout. The strength, the gentleness and sagacity of these tame elephants make them very valuable as beasts of burden.

Copyright, 1906, by H. C. White Co., N. Y.

while the Great Mogul agreed that Bengal should belong to the British.

THE FIGHTS BETWEEN THE BRITISH AND THE NATIVE RULERS OF INDIA

In this way, although the British had not planned any such thing, they suddenly found that their trading company, with its few factories, had become ruler of a whole great province, while the Nawab of another great province, the Carnatic, had promised them obedience. The two provinces together were only a small part of India, as if a foreign power had become master of two or three of our New England states. But they were larger than any of the provinces ruled by a single native prince—except, of course, the Mogul, who was supposed to rule over all of them, including the British. Then the Government in England appointed a governor-general for these new dominions—Warren Hastings—who has been very much blamed for some of his doings, and was impeached for them in Parliament, because people did not understand why he had acted as he did. Yet it was owing to him that a good and strong government was finally established at all.

Now, while the British were chiefly anxious to secure what they had won, and to establish a good government in those provinces, the native rulers made sure that they wanted to conquer more; besides which, two or three of the native rulers were anxious to enlarge their own territories, and perhaps to make themselves masters of all India, now that the Mogul's real power was so small; therefore they would have liked to turn the British out again.

It thus happened that three times in the course of twenty years the great southern state of Mysore defied the British, and a little later the people of Nepal, which is in the mountains along the north side of India, where they edge the plain of the Ganges, tried to take possession of part of the plain below them.

THE SPREAD OF BRITISH RULE OVER ALL INDIA, AND THE TERRIBLE MUTINY

So there was war with them, at the end of which they, too, gave up part of their lands; but the people there, who are called the Ghurkas, made friends with the English, and now the Ghurka regiments in the British Army are some of the best regiments in the world. Then a number of princes of the race called Mahrattas made war with Great Britain, and from some of them also the greater part of their lands were taken away. Last of all the Sikhs, who ruled in the Punjab—their name is pronounced *seek*—invaded British territories, and rose against the British, as Mysore had done, and when the war was over the British took possession of the Punjab. Then all India within the circle of the mountains and the sea was under their rule, though the princes who had not brought on the war were allowed to remain the lords of their realms, on condition that they did not rule as tyrants, or try to stir up wars. But in the year 1857 there came a terrible time, when the Sepoy regiments all along the Ganges plain mutinied against their officers and against British rule, the Mussulmans among them seeking to restore the old dominion of the Moguls. Where there were enough regiments of British soldiers, the mutiny was kept in check; but where there were many native regiments and few white soldiers, defence was difficult.

THE PEACE THAT CAME AFTER THE MUTINY, AND THE NEW EMPIRE

At Cawnpore, the leader of the rebels, Nana Sahib, promised to spare the British if they surrendered; but he broke his word and murdered them all. At Lucknow, the garrison held out and endured through a long siege, till they were relieved, first by Havelock and Outram, and then by fresh troops from England led by Sir Colin Campbell. Because there was a great rising of mutineers at Delhi, where the Mogul was, a British force besieged the city, and took it after a time. But after Sir Colin Campbell had arrived with his fresh troops, it was not very long before the revolt was crushed altogether.

After that the British nation said that it was time to end the ruling of India by a company of merchants; so the Queen of England ruled India. Finally, in 1877, Queen Victoria was given the title of Empress of India, because the Mogul rulers had been called Emperors. Now the King of England is also Emperor of India, with its many millions of people.

THE NEXT STORY OF COUNTRIES IS ON PAGE 1781.

The Book of SCHOOL LESSONS

WHAT THESE LESSONS TEACH US

THE Reading lesson in these pages teaches us what we mean when we speak of singular and plural numbers. Our Writing lesson shows us how to write more letters that come above and below the line, and in our Arithmetic lesson we learn how to add little numbers together. There are still more surprizes for us in the Music lesson, and our Drawing lesson shows us how to draw a box and a table. The Picture-Story in French describes how the party, which has now reached Paris, spend their first evening at the hotel.

CONTINUED FROM PAGE 1475

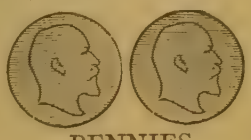
READING

THE DIFFERENCE BETWEEN ONE AND TWO

WHEN you see a dog come running round the street corner, you call out, "Look at that DOG!" but if another dog came with the first one you would say, "Look at those DOGS!"

And if I gave you a penny you would tell mother, "I have a PEN-NY," but if I gave you two you would say, "I have two PEN-NIES."

PENNY



PENNIES

Then the Queen of Hearts did not make only one TART; she made many TARTS, and the naughty knave came and stole them away.

TART

TARTS

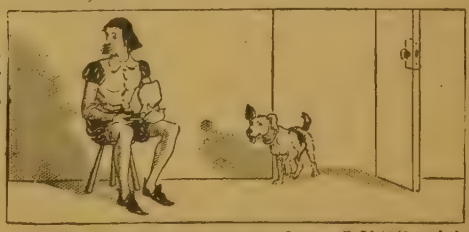
So, you see, there is a difference between DOG and DOGS, and between PENNY and PENNIES, and between TART and TARTS. DOG means only one dog, but DOGS means any number of them—two, or three, or a hundred, or a million. We say that DOG is in the *singular* number and DOGS in the *plural* number. When there is only one thing it is singular; when there are more than one it is plural.

If you look in the looking-glass you will see that you have two hands; but put one in your pocket and you will only see one hand in the looking-glass. So, you see, we talk about one HAND, but two HANDS.

Go on looking in the glass, and you will see many more things that you can make either singular or plural. Here are some of them:

EYE	EYES
LIP	LIPS
ARM	ARMS
THUMB	THUMBS
FIN-GER	FIN-GERS
NAIL	NAILS
LEG	LEGS
FOOT	FEET

Now you will be able to read this riddle, and to answer it as well:



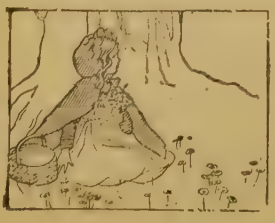
Two LEGS sat upon three LEGS with one LEG in his ARMS;
In came four LEGS and ran away with one LEG;

Up jumped two LEGS, picked up three LEGS, and threw them at four LEGS.

By this time we are ready for some rhymes, so here they are. They are not the rhymes we know, are they? But perhaps we shall like them as well.

When PUSS IN BOOTS wears, STOCK-INGS too,

And Mary is not so contrary,

When RED RIDING HOOD  is dressed in blue,

And every CHILD becomes a FAIRY,

We'll fly away,
I think—don't you?

When the little BOY who plays the HORN

Is dressed in green instead of blue,

When MILK-MAIDS are not all forlorn,

And every fairy tale comes true,
We'll fly away,
I think—don't you?

When SPIDERS all stop catch-ing FLIES

And tell Miss Muffet what to do,

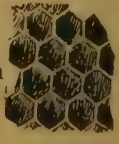
There'll be no COB-WEBS on the skies,

OLD WOMAN with the BROOM, for you;

So fly away
And find your shoe.

When KINGS no longer count their MONEY,

And BLACK-BIRD PIES hold twenty-two,

When QUEENS like jam much more than  HONEY

And maids have noses fixed with glue,
I think it will
Seem queer—don't you?

PRIMARY READING LESSON

There was an old woman,
Tossed up in a basket,
Seventeen times as high as the moon,
Where she was going,
I could not but ask it,
For in her hand she carried a broom.

Old woman, old woman, old woman!
Where are you going?
Where are you going in a basket?
Where are you going with a broom?

I go up, up, up!
I go so high, so high, so high!
Up over the tree-tops,
Up over the moon,
To the sky, to the sky, to the sky!

Old woman, old woman, old woman, quoth I,
Where are you going up so high?
To sweep the cobwebs off the sky.
May I go with you?
Aye, bye and bye.

May I go with you?
Aye, bye and bye.
May I go up so high?
Aye, bye and bye.
Will you come back?
Aye, bye and bye.

I am in a basket,
I go up to the sky,
I go up to brush the cobwebs off.
Here I go up, up, up!
Good-bye! good-bye! good-bye!

ACTION SENTENCES

Play you are the old woman,
Jump into the basket,
Take the broom,
Sail away.
Come back again.

Copyright, 1910, by M. Perry Mills. See special illustrated plate, Vol. XIII.

LITTLE VERSES FOR VERY LITTLE PEOPLE

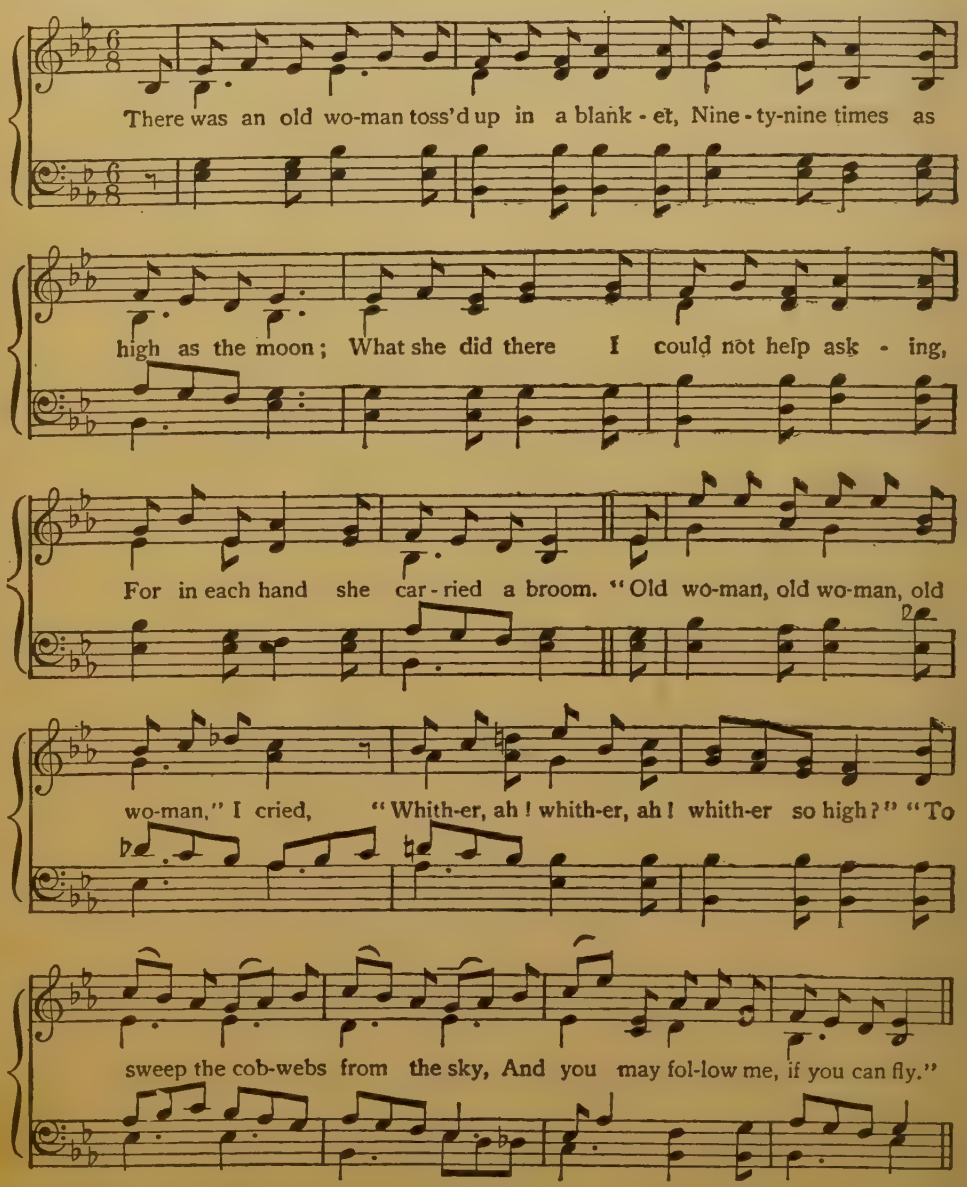
GOOD little boys should never say
"I will," and "Give me these."
Oh, no! that never is the way,
But "Mother, if you please."

And "If you please," to Sister Ann
Good boys to say are ready;
And "Yes, sir," to a gentleman,
And "Yes, ma'am," to a lady.

ST. SWITHIN'S DAY, if thou dost rain,
For forty days it will remain;
St. Swithin's Day, if thou be fair,
For forty days 'twill rain nae mair.

IF Candlemas Day be bright and fair,
Winter will have another flight;
If on Candlemas Day it be shower and rain,
Winter is gone and will not come again.

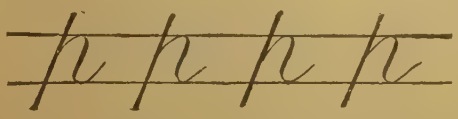
THE OLD WOMAN TOSSED UP IN A BLANKET


There was an old wo-man toss'd up in a blank-et, Nine-ty-nine times as
high as the moon; What she did there I could not help ask-ing,
For in each hand she car-ried a broom. "Old wo-man, old wo-man, old
wo-man," I cried, "Whith-er, ah! whith-er, ah! whith-er so high?" "To
sweep the cob-webs from the sky, And you may fol-low me, if you can fly."

MORE LETTERS BELOW THE LINE

"ARE there more letters with loops below the line, mother?" asked Nora, when she and Tom next came to their mother for the writing lesson.

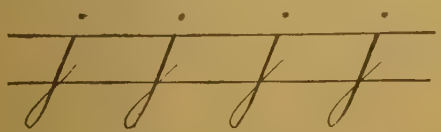
"Four of them," her mother said, "and I hope we shall write all of them to-day. But first we are going to write one other letter with a stroke below the line, but without any loop. It is p. What do you think of it?" she asked, as she wrote some like this:



Nora thought it reminded her of h—at least, the last part of it was just like h; and Tom said the first part was a long stroke.

"You are both right," said their mother; "p does begin with a long stroke, and ends like h, but we must be careful to make the stroke the proper length. It goes above the upper line just as far as t does, and below the lower one not quite so far as any other letter with a tail. We must remember that it does not go very far above or below the line.

"This is the next letter, j," continued the children's mother, as she wrote it:

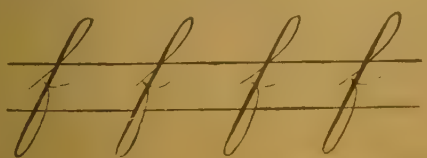


"J has a loop," said Nora, "and—— Why, it has a dot! Look, Tom!"

"Each letter i has its own little eye," said Tom, who remembered all about i.

"J," said his mother, "really did grow from i, just as a plant grows from a seedling. Once there was no j; but it was useful to have one, and so someone made i grow a looped tail. We must take care to make the loop just like that of g. Let it cross over just below the line, Tom.

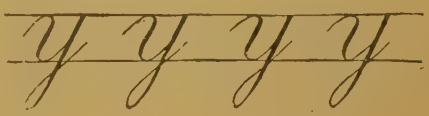
"The next letter, f, has two loops, and this is how we write it:



"There is this to notice about f: the upper loop is not quite so tall as that of other looped letters, and what do you see strange about the lower loop, Nora?"

Nora watched while her mother wrote an f, and then said the lower loop was on the other side. Tom said she meant the right side, and their mother showed how it ended half-way between the lines near the middle of the letter on the right side of it, as Tom had said. Nora thought f was a pretty letter, because she liked making the loops, but neither she nor Tom found it very easy to write at first, for they wanted to make the lower loop on the left side, like that of g and j, and the loops looked uneven; but they tried again and again till they made nice ones.

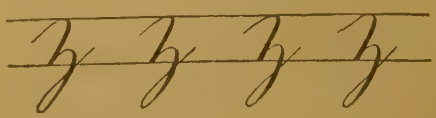
"There are only two more small letters to write—y and z, and then you will know all the small letters," their mother told them, as she wrote y like this:



Tom noticed that y began like the last part of h, and, Nora added, like the last part of m and n also; and both of them found its tail had just the same loop as that of g.

"Now the last letter of the alphabet, Tom," said his mother.

"Z," he promptly replied, as he watched her writing it like this:



She pointed out how z starts with a hook, as y does, but leans more to the right, and then makes a much smaller curve just above the lower line, ending in a loop like that of g. Only the middle curve was new to Tom and Nora, and they soon succeeded in making it nicely, and then their mother told them that before very long they should learn to do something quite new.

ADDING THE NUMBERS TOGETHER

NOW that we know the names of the numbers up to 99, we can learn how to add together numbers which are bigger than those we used in our addition sums last time.

We will try first with the numbers 65 and 32. Suppose we have 65 pencils, and we arrange them in the same way as we did those on page 1467. We know there will be 6 bundles of ten, and 5 loose pencils. If we put them in our two boxes, the boxes will be numbered like this: [6] [5]

Next we take our 32 pencils. These will make 3 bundles of ten, and 2 loose pencils Now, if we put the loose pencils into the right-hand box, there will be in it altogether 5 pencils and 2 pencils which make 7. And putting all the bundles into the left-hand box, there will be 6 bundles and 3 bundles, which make 9 bundles altogether. So that we shall have to alter the figures on the boxes into 9 and 7, for 9 bundles and 7 loose pencils, which is ninety-seven (97) pencils altogether.

If after doing this problem with the help of the pencils we had to write it down in our books, we should do it this way: We first write down 65, which means 6 "tens" and 5 "ones"; then underneath the 65 we write the 32, which means 3 "tens" and 2 "ones," taking care to write the "ones" under the "ones," and the "tens" under the "tens," and drawing a line under them like this:

65
32
—

Next we count up the "ones," and say 2 and 5 make 7. So we write down a 7, for 7 "ones," underneath the 5 and the 2. Having counted the "ones," we count the "tens" in the same way, 3 and 6 make 9; and we write a 9, for 9 "tens," underneath the 6 and the 3. This tells us that the answer is ninety-seven, and our sum now looks like this:

65
32
—
make 97

Very likely, now, we can do another sum like that, without having to think about the boxes and do all the counting. We can write down the two numbers in the proper way, so that the "ones" of the second number come under the "ones" of the first number, and the "tens" of the second under the "tens" of the first, and then count how many "ones" and "tens" there are altogether.

The gardener gathered 44 apples off one tree, and 25 apples off another. How many apples were there altogether?

The first tree had 44 apples.
The second had 25 apples.
—
make 69 apples.

Here are two more questions for you to work out by yourselves:

1. A man traveled 52 miles by train one day, and 34 miles the next. How many miles is that altogether?

2. Tom had 40 marbles, and his uncle gave him 58 more. How many had he then?

Now we will try something a little bit harder—not very much, but not quite so easy as those we have just done. We will add together 47 and 23. Let us use the boxes again for a few minutes. 47 will be 4 bundles in the left-hand box, and 7 loose pencils in the right-hand box. Again, 23 will be 2 bundles in the left-hand box and 3 loose pencils in the right-hand. That makes altogether 10 loose pencils in the right-hand box, and 6 bundles in the left-hand.

[4] [7] is how we have the boxes at first.

[6] [10] is how we have them when we put the two sets together.

But *this* will not do. What is wrong? Too many loose pencils. We must never have more than 9 in the right-hand box. But, after all, it is very easy. We can *tie those ten loose pencils into a bundle and carry them to the bundle-box*. Then we shall have no pencils left in the right-hand box, and 7 bundles instead of 6 in the left-hand. The boxes will then be marked [7] [0]

So now we have found out that 47 and 23 make 70. If we have to write the sum down on paper, we arrange the

two numbers just as we did before, with the "ones" under the "ones," and the "tens" under the tens," like this:

47
23
—

Then we say, "3 'ones' and 7 'ones' make a 'ten.' " Write down a 0 under the "ones," because there are no "ones" left, and add the "ten" to the other "tens," saying, "1 'ten' and 2 'tens' make 3 'tens'; 3 'tens' and 4 'tens' make 7 'tens'." Write a 7 under the "tens." After we have done a few sums of this sort we can do without saying even as much as that; we can leave out the words "ones" and "tens."

47
23
—
make 70

Say, 3 and 7, 10; put down 0, carry 1.

1 and 2 make 3, and 4 make 7; put down 7.

Try to find the sums in the same way.

1. There are 34 houses on one side of the street, and 36 on the other side. How many houses are there on the two sides together?

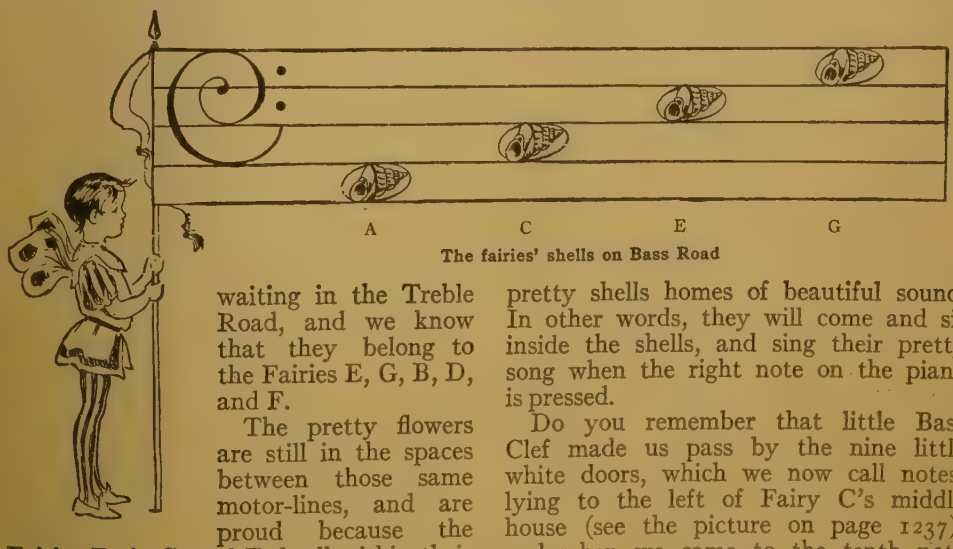
2. One boy sold 22 oranges, and another sold 18. How many oranges is that altogether?

THE FAIRIES INSIDE THE SHELLS

LITTLE Bass Clef is very anxious to attract our attention. He has waited long and patiently to see what secret the flowers had to tell, and now he knows what a pretty surprize the fairies had prepared, he is very eager to see if the story whispered in his ears by the wind is true.

Once again we look at the motor-cars that are lying in the spaces between the motor-lines where the cocoa-nuts are found.

The kind little fairies have given Treble Clef a treat, and they feel that Bass Clef must have his share in the happiness that comes to all good, industrious workers; so four of the wee people say they will make these four



The fairies' shells on Bass Road

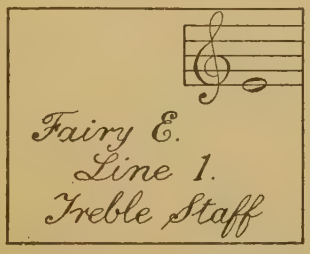
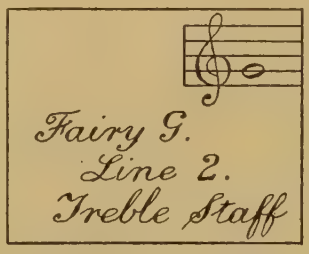
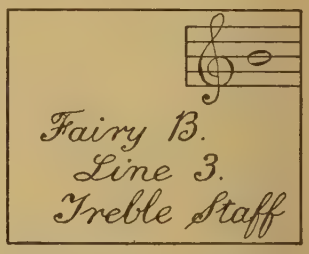
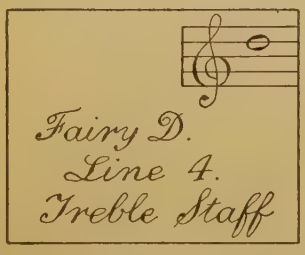
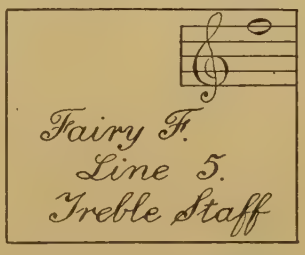
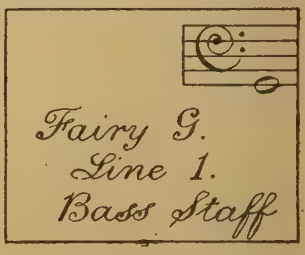
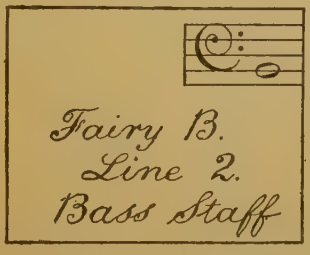
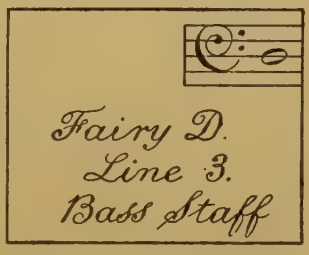
waiting in the Treble Road, and we know that they belong to the Fairies E, G, B, D, and F.

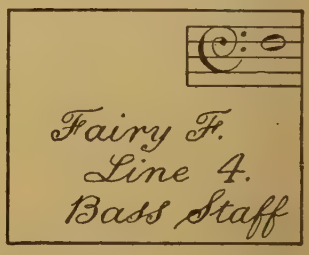
The pretty flowers are still in the spaces between those same motor-lines, and are proud because the Fairies F, A, C, and E dwell within their tiny petals.

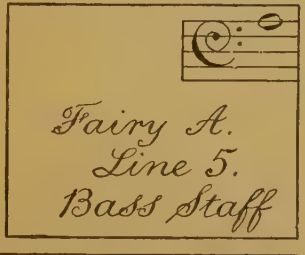
The cocoa-nuts remain in their places on the five motor-lines in the Bass Road, very happy to be the homes of Fairies G, B, D, F, and A.

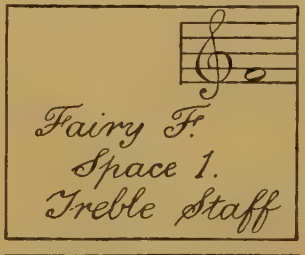
And now we have something else to find out. Look at the pretty shells pretty shells homes of beautiful sound. In other words, they will come and sit inside the shells, and sing their pretty song when the right note on the piano is pressed.

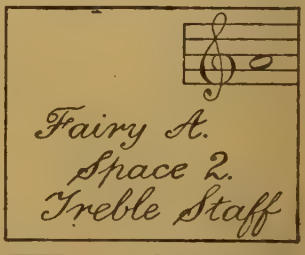
Do you remember that little Bass Clef made us pass by the nine little white doors, which we now call notes, lying to the left of Fairy C's middle house (see the picture on page 1237), and when we came to the tenth note we pressed it very firmly, and immediately we heard the deep voice of Fairy G? Well, Bass Clef now says, "If you go to the little white note on the right side of Fairy G you will find out the song of the shell in this first space between Fairy G's cocoa-nut on line

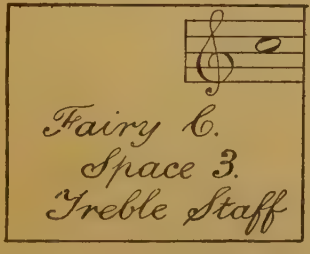
THE ADDRESSES OF THE LITTLE FAIRIES



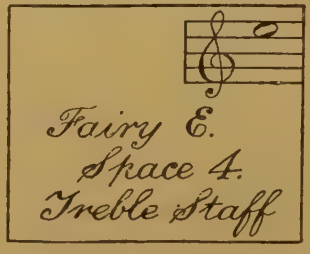
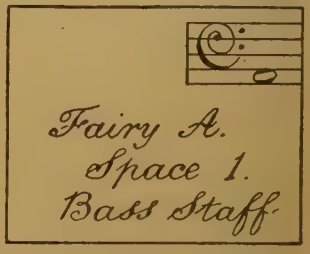


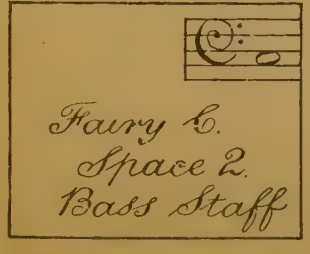


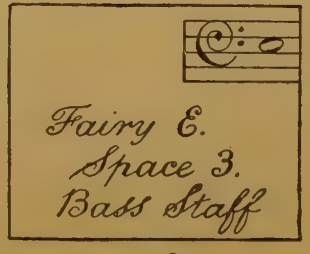


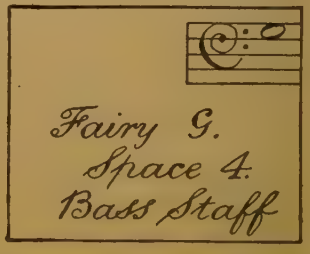












number one, and Fairy B's cocoa-nut on line number two. Press the little white note and listen:

Indigo shell, the song of the spray,
And space number one for Fairy A.

Fairy A's shell

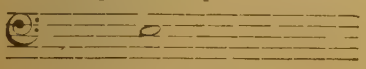
"What about the second shell?" we ask Bass Clef. He shakes his wise little head, and tells us to go to the piano, saying, "You remember on which line Fairy B's cocoa-nut is to be found? Well, the very next white note on the right of Fairy B is the one to press, if you want to find out about the shell in the second space." Directly we press the note we hear this:

A tiny red shell, space number two,
Fairy C sings, "How do you do?"

Fairy C's shell

The third shell is now arousing our curiosity, and the only thing to do is to press the little white note between Fairy D's cocoa-nut on the third line and Fairy F's cocoa-nut on line number four. Press it and listen:

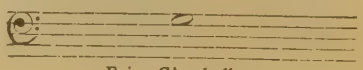
A yellow shell for Fairy E,
We both quite like space number three.



Fairy E's shell

One more shell, so one more fairy to find. To discover what we want we will again visit our piano, and choose the white note in the fourth space, lying between Fairy F's cocoa-nut and the cocoa-nut which has been claimed by Fairy A. Press the note and we shall hear:

Space number four, little blue shell,
Fairy G's voice all news will tell.



Fairy G's shell

Do you not think that this magic kingdom of the piano is a very happy one? In the Treble Road we find fairies in their motor-cars, E, G, B, D, F. In the Bass Road fairies are laughing in their cocoa-nuts. Their names, as you know, are, G, B, D, F, A. Treble Clef again shows us fairies kissing the petals of the delicate flowers in which they have found so pretty a home—the Fairies, F, A, C, E.

Bass Clef comes forward once more to introduce the fairies, who are seated inside the pretty shells, listening to the song of the waves. You know them by their names, A, C, E, G. All this, and much more, can be heard and seen by you and me, as day by day we find ourselves more at home in our magic kingdom. We must be quite sure we know how to address the fairies' letters when we write to them. So we will direct some envelopes, like those on the opposite page, ready for the little notes, when we want to write to them.

Staff, you know, is the fairies' word for road.

Now that we have seen how to direct the envelopes, shall we have a game of play, and see who can address the greatest number?

DRAWING

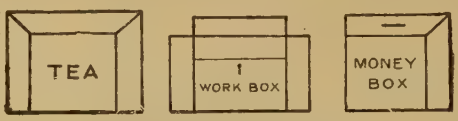
THE RIGHT WAY TO DRAW A BOX

TO-DAY we are going to learn how to draw a box. It seems quite an easy thing to do, but it really is not easy at all. In drawing boxes, just like everything else, there is a right and wrong way of doing it. On the next page we can see some of the wrong ones, and some of the right ones. Can you tell which is which without being told? Suppose we try to draw some ourselves, without looking at a real box, or any of the pictures.

I hope the one you have chosen is the right one. How many sides has it? An ordinary box has six sides—four standing up, and two—the top and the bottom—flat; but you can never see more than three at one time. Sometimes we can see only two, and sometimes only one; but we don't draw it often to show only one side, as it doesn't look like a box at all then.

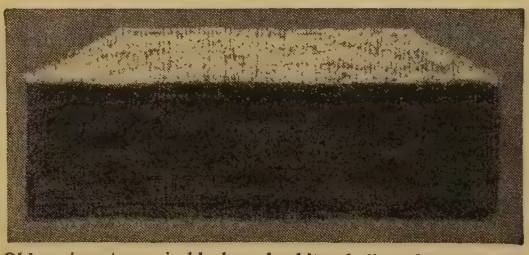
Choose a box with straight sides and a flat top, and put it exactly in front

of you a little way off on the table. If it is exactly opposite to you and your eye above it, you can only see two sides—the front and the top. Now move it to the right and you will see three sides—the front, the top, and one other. Move it to the left, and you see three again, but they will not be the same that you saw before.



The wrong way to draw boxes

The right way to draw boxes



Oblong box drawn in black and white chalk on brown paper

Get some brown paper and pin it to your board, and get your white and black chalk. It is better to choose a square box to copy, although an oblong one will do. Put the box exactly opposite to you, and when you are drawing things like boxes, always begin with the part that is nearest to you. It is the front side this time, and that is easy, as it is only a square or an oblong. Take your black chalk, and make the best square or oblong that you can, and fill it in with chalk.

This is a square box drawn in black and white chalk on brown paper

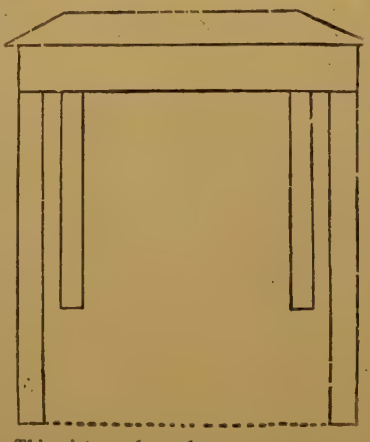
How can you make the top look flat? It will not look right if you make it the same size and shape as the front, because things look smaller when they get a little further away from us.

When you are in the street, the lamp-posts that are far away look quite tiny, yet they are the same size as those quite near; and when you are at the seaside, big ships look smaller and smaller as they sail away from the shore.

So the part of the box that is furthest away from us must be smaller than the one nearest to us. The top of the box must slant, and look narrower than the front. You must look at the picture to see the way to do it.

Make the top with white chalk, because it will look the lightest part. If you were drawing with your back to the window, the front side might look the lightest, but you must never draw with your back to the light, because it is very bad for the eyes.

We shall not learn this time how to draw the box when it shows three sides, as it is difficult to do; but if you like to get your pencil now, and some white paper, you can copy the last picture on this page, which shows how to turn a box into a table.



This picture shows how we may turn a drawing of a square box into a table

Draw the box first, then put some more lines to make the legs and the thickness of the wood. Rub away the line that is dotted, and there is the table.

Square legs would show the sides as well as the front, but we must not attempt to draw the side view just yet.

Why are the back legs shorter than the front? They are not really shorter in a real table, but those that are furthest away from us always look shorter.

LITTLE PICTURE-STORIES IN FRENCH

IN our story this time, which is continued from page 1475, we read how the party spend their first evening in Paris. The first line under each picture is the French, the second gives the English word for the French word above it, and the third line shows how we make up the words into our own language.

Nous sommes à l'hôtel.
We are at the hotel.
We get to the hotel.

Le maître d'hôtel nous salue.
The manager of hotel us salutes.
The manager greets us.

La bonne nous montre nos chambres.
The maid to us shows our rooms.
The maid shows us our rooms.

Nous lui demandons son nom.
We of her demand her name.
We ask her her name.

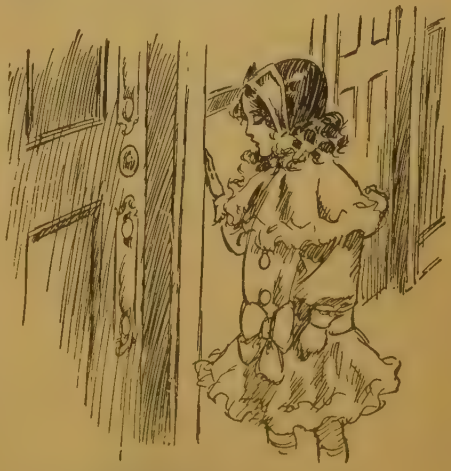
Elle répond: "Annette."
She replies: "Annette."
She answers: "Annette."

Bébé a bien sommeil.
Baby has much sleep.
Baby is very sleepy.

Maman dit: "Embrasse-moi, bébé."
Mamma says: "Embrace me, baby."
Mamma says: "Kiss me, baby."

Tantôt nous entendons un petit cri.
Presently we hear a little cry.
Presently we hear a little cry.

Jeannette court à la porte.
Jenny runs to the door.
Jenny runs to the door.



Une petite fille est là.
A little girl is there.
A little girl is standing there.

Jeannette la conduit à maman.
Jenny her conducts to mamma.
Jenny leads her to mamma.

Elle pleure.
She cries.
She is crying.

Maman la console.
Mamma her comforts.
Mamma comforts her.

Elle a perdu sa bonne.
She has lost her nurse.
She has lost her nurse.

Nous lui montrons de drôles d'images.
We to her show of droll of pictures.
We show her some funny pictures.

Elle éclate de rire.
She bursts of to laugh.
She bursts out laughing.

Quelqu'un frappe à la porte.
Someone knocks at the door.
Someone knocks at the door.

Maman crie: "Entrez!"
Mamma cries: "Enter!"
Mamma calls out: "Come in!"

La porte s'ouvre.
The door itself opens.
The door opens.

Une jeune femme entre.
A young woman enters.
A young woman comes in.

C'est la bonne de la petite fille.
It is the nurse of the little girl.
It is the little girl's nurse.

La bonne tend les bras.
The nurse tenders the arms.
The nurse holds out her arms.

La petite fille court a elle.
The little girl runs to her.
The little girl runs to her.

Nous crions tous: "Bonsoir!"
We cry all: "Good-evening!"
We all call out: "Good night!"

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 1945.

MAKING A SET OF DOLL'S FURNITURE

THE DRAWING-ROOM AND BEDROOM

CONTINUED FROM 1607

TO make a charming suite of doll's furniture of any size to suit the room it is for, one only needs a coil or two of silk-covered round hat-wire, which costs a nickel the coil of three yards, a scrap of colored satin or plush for the cushions, and a needle and thread. A small pair of pliers is useful, especially the sort one can sometimes buy at a dime a pair. They are not strong enough for real tools, but they do very well for this work, as they are without the file-like roughness on the inner surface which proper pliers have, and therefore would not be so likely to rough up the silk covering of the wire. But fingers can generally do all the bending required.

The drawing-room set which we are going to make consists of two easy-chairs (lady's and gentleman's), a sofa, a gipsy table, and six small chairs in black wire.

The drawing-room set of furniture for the doll's house

We will begin by making a small chair. Take one end of the wire and, having measured seven-eighths of an inch, bend it sharply back on itself and secure it firmly at the end with double thread. Bend again at right angles and you have one back leg of the chair and the back of the seat, as in picture 1. Measure three-quarters of an inch and bend downward for the second back leg, which make double like the first, and sew tightly at the top.

Now turn the corner, and give seven-eighths of an inch to the side of the chair, then bend down sharply for a front leg, which should be a little shorter than the back ones, as the back ones, when finished, are curved slightly outward. The front of the seat is wider than the back; and as this, too, should be curved, an inch will not be too much for it.

When we have done the second front leg, and turned the corner for the second side, we shall find that we have come round to the starting-point. We must secure the wire at this corner very tightly.

Now we bend the wire upwards for the back of the chair. The back has a loop in it, which will need to be very carefully done, and secured at the crossing (see picture 2). When the back is firmly finished, we complete the framework of the chair by passing one row of wire entirely round the seat, and, leaving quarter of an inch to spare before cutting off the wire, we turn it round underneath the top of the nearest leg, and sew it down neatly out of sight. It is here that pliers are useful. By bending sharply backwards and forwards a few times, you can break the wire with them, and leave only the covering to be cut with the scissors, which wire always spoils. With the pliers one can nip the end of the wire neatly under, instead of hurting one's fingers. The chair-seat is simply a piece of cardboard cut to the shape of the frame, covered with plush or satin, and neatly tacked round on to the wire, the stitches being kept on the under side.

We should start to make an armchair from a front leg, instead of a back one, so that when the four legs and seat-frame are complete we can start an arm shaped like picture 3. It is firmly fixed to the top of the back leg at the part marked x, and then the wire is carried upwards as before, to make the back.

The back of the larger armchair has a double curve in it like a figure of 8, as in picture 4, and the bottom of the lower loop

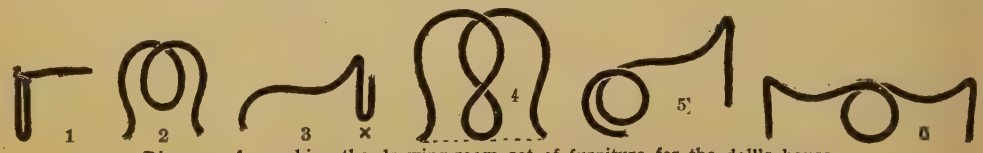
is sewn to the middle of the back bar of the seat. When the back is done, make the second arm to correspond exactly with the first, ending it opposite to where the other began; and the second row of wire round the seat finishes the armchair. The legs should measure the same as the small chair, but the seat is $1\frac{1}{4}$ inches from back to front, $1\frac{1}{8}$ inches across the back, and $1\frac{3}{8}$ inches across the front. The arm is five-eighths of an inch high where it joins the back, and the back itself is $1\frac{3}{8}$ inches high from the seat.

The sofa is made on the same plan as the armchair, beginning at a front leg, but the arm at each end is more ornamental, having a turn in it, like picture 5. The back has a circle in the middle, and is curved like picture 6.

The seat of the sofa is $2\frac{1}{2}$ inches long in front, and rather less behind; from back to front about 1 inch. The circle is sewn to the middle of the seat.

The lady's easy-chair has no arms. It is much like a small chair, but has shorter legs, and a larger and broader seat. The back has one large loop, which reaches the back of the seat and is sewn down to it.

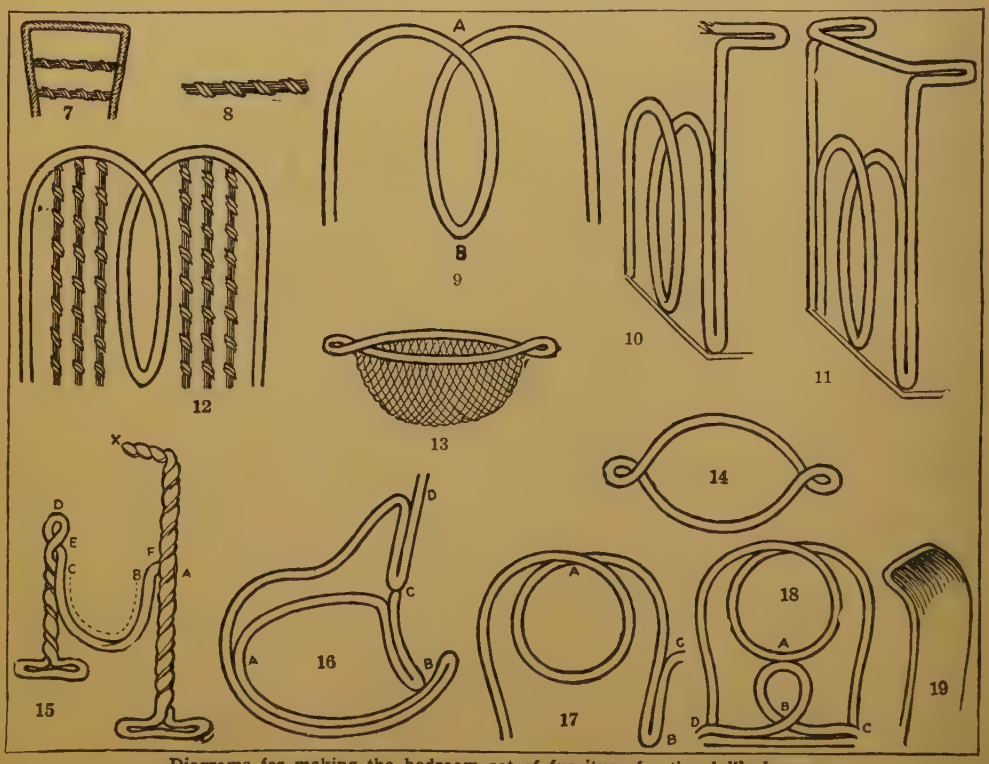
Now for the gipsy table. Start as before, and make a double leg $2\frac{1}{2}$ inches long. Carry the wire straight along for $1\frac{1}{2}$ inches; make a second leg, leave a second straight piece, $1\frac{1}{2}$ inches, then a third leg, and a third straight piece, then join this to the top of the first leg. We now have a triangle with three long legs. Bend the straight pieces until the triangle becomes a circle. Take the end of each leg with the pliers and twist it hard until it has an ornamental twist for its whole length. Then bend all the legs towards one another under the table, crossing them in the middle, gipsy fashion, and fasten them very strongly together with needle and thread. The top of the table is a round of cardboard, cut to fit, and covered with black satin.



Diagrams for making the drawing-room set of furniture for the doll's house

For our bedroom suite we shall require white silk wire of two sizes and a skein of white silk thread or a ball of any of the silk substitutes.

The small chairs, made of the wire at three yards a nickel, are very simple—a plain square back with two bars across it, like the little sketch (7) on this page. The bars are of twisted silk or thread, of which we want a coarse kind. We have it double, and push

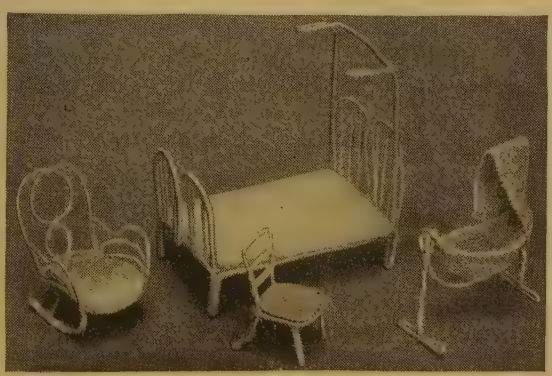


Diagrams for making the bedroom set of furniture for the doll's house

the needle in underneath the back of the seat and up the back, where it will least show, to the spot where we wish the first bar to be. Then we carry the thread across to the other side and back again. Next we pass the thread round the bar thus formed, just three or four times to form a twist, draw it tight, and, sticking the needle in at the opposite end of the bar again, we bring it out about a quarter or three-eighths of an inch higher up, where we want the second bar to be. This we make in the same way. If it is nicely done, it should be quite a little ornamental twisted bar, like picture 8.

When this is done, pass the needle down so as to get the fastening off behind a back leg, or somewhere where it will not be seen. The chair-seat may be either white or colored, in silk, satin, or sateen of any sort you think pretty, stretched over a piece of card, as in the chairs already described.

The bedstead is made of thicker wire, at a few cents a yard. It will take nearly a yard and a half. We start as for a chair, at the back leg. The legs are three-quarters of an inch high, the ends 2¼ inches long, and the sides 3½ inches long. When the legs and sides are done, we find ourselves back at our starting-point and, having secured the wire very firmly, we begin the head of the bed, by turning the wire upwards and forming two curves with a loop in the middle as in picture 9. The top of the loop, A, where the wire crosses, must have some firm stitches with double thread, and the bottom, B, must be strongly fastened to the exact centre of the framework between the back legs. This loop should be about 1½ inches high.



The bedroom set of furniture for the doll's house

This done, carry a line of wire up the end of the curve and about 1½ inches above it; double back for half an inch, and bend the double part at right angles as in picture 10. This is the "Italian" shaped top on which to hang lace curtains. Then carry a bar across, an inch above the top of the back to the other side, make another half-inch projection to correspond, and take the wire downwards, along the other end of the bed-head, as shown in picture 11.

Carry a second line of wire along the side of the bed and form the foot, like the head, but half an inch shorter and without the top; bring the wire up the other side of the bed, and finish off under the corner by a back leg. The bars which fill head and foot are made just like the chair-bars, three in each loop, at equal distances, as in picture 12. Lastly, cut a piece of card exactly to fit the framework of the bed, cover neatly in white sateen, or other material, and fasten it to the ends and sides of the framework. We must take pains to make the bedstead stand quite firmly, and must pull and bend and coax it until it does this.

The baby's cot is shaped like picture 14, with a bag or net sewn all round it, like picture 13. Make a stand for it like picture 15. Starting at point A, with single wire, come downwards to the foot. Having formed this, we go upwards, twisting the two wires, to A, again, past A right up to X, turn back and come down to A, yet again twisting the wire. At A turn off and bend the loop B to C. Then form the knob, D, and, coming downwards, make the second foot the same size as the first, to stand exactly opposite to it. Then go up again, twisting the double wire to D, and finish off there.

The loops at the ends of the cot are sewn to the two standards at E and F, or just to clear the loop B to C. The taller standard, which should have an entire height of about 3¼ inches, must be bent at right angles about three-quarters of an inch from the top, to form a support for the curtains of lace edging which shade the cot. A rocking-chair makes a charming little addition to the furnishing of our bedroom. It is made in the thinner wire. Start with the back legs, which are about as long as ordinary chair-legs, and the back of the seat a full inch wide. The arm and rocker come next. Having sewn well the top of the second back leg, turn from it a big curve, doubling the wire and returning as shown in picture 16, securing the wire at A, and sewing the leg to the rocker at B. Then, having formed the arm, turn sharply down to meet the top of the back leg again at C, and double back to D, where it must be sewn again. From D form the upper part of the back, as in picture 17, stitching firmly at A. When we reach B, and secure our wire, we shall have to make the second arm and rocker by turning back to C, being very careful that these correspond exactly in size and shape with the first.

We shall now find ourselves back again at point B, in picture 17, from which we start to make the lower part of the back, shown in picture 18. Sew at A, B, C, and D, then all we have to do is to carry the wire round to form the seat on the inner side of the rockers, and finish off just over the point where we began.

We must be careful to shape the cushions to fit the seat-frame, tacking it round to show the frame in front, then bend the front of the seat slightly over, as in picture 19.

Later on we shall learn how to make the furniture for two more rooms—the dining-room and the kitchen.

FLOWER-POTS MADE FROM OLD TIN CANS

OLD tin cans are usually thrown into the dust-heap after they have served the purpose for which they were originally intended. But there are many uses to which they may be put, and we shall see in this article how they may be utilized instead of being thrown out as valueless.

One of the most convenient uses to which they may be put is to serve as flower-pots, either singly or arranged suitably. In this article are several illustrations showing old tin cans adapted for flowers, and with a little explanation the adaptation and ornamentation are easy to understand.

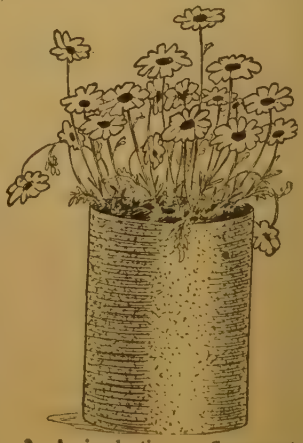
The tin cans most suitable are round fruit cans of a capacity from a quart upwards. They should also be deeper than they are wide, but although cans of this size and shape are the best for the purpose, cans of other shapes, such as square and oblong, can be used if the others be not available.

1. Tin can flower-pot, with pine-cone decoration

For flower-pots the cans should have the bottoms pierced, because a flower-pot made from a tin can must have means of drainage just as well as an ordinary earthenware flower-pot. The usual hole in a flower-pot is round and in the centre of the bottom. We may make the holes of our tin can flower-pots like this, but to make a number of small holes is much easier than to make one large hole. By taking a sharp nail—say, a three or four inch wire nail—and a hammer, we can easily make a few holes in the bottoms of our old cans. We must turn the cans upside down in making these holes, so that the ragged edges we make will be inside the cans, and not outside, where they would be apt to mark or tear anything upon which they were placed. We might as well understand the reason why holes are necessary in flower-pots. If there were no holes the water would not be able to run away, and if the same water lies in the can it makes the earth in the pot sour, so that the flowers languish and die. Having made the holes, we think now about the appearance of our flower-pots.

We purchase some asphalt—say, about seven pounds—and melt it over a fire, using any old pot for the purpose. We must see that the pot has no holes in it, or the asphalt may run out into the fire, and that would make trouble. It is well that the asphalt should be as thin as possible, therefore we had better have it boiling. When it has reached the boiling stage we remove it from the fire and dip the tin cans in one by one. We may manage it all right with just a stick for taking them out again, but we can tie a string to one, threading the string through one of the holes that we have made in the bottom and taking care that the other end of the string is not allowed to get right into the hot asphalt. We also want a box containing clean dry sand, and as we take the cans from the asphalt pot we put them at once into the sand, rolling them over well and putting the sand inside also, making certain that every part of the surface both inside and outside has received a proper coating of sand. The purpose of the asphalt is not for ornament only, or that it may cause the sand to adhere to the tin. It gives the tin cans a coating through which water cannot penetrate, so that cans treated as we have here

2. Cylindrical flower-pot made with tin cans



3. A simple tin can flower-pot

described are not liable to rust, as they would be if used without the asphalt coating.

Other things may be used instead of sand; for instance, dry packing moss as used by florists or dead leaves may give a very good effect. If we wish to use this, we put it on exactly as we have described in the case of the sand. When the asphalt has become hard, which it does very speedily, we find that we have a very presentable flower-pot, and one that we can use exactly as we would use an ordinary brown earthenware flower-pot.

Now let us look at the pictures. In picture 3 we have a flower-pot made exactly as we have described, and picture 1 shows a hanging flower-pot made in the same way. In the latter case there are two festoons of pine-cones around the body, and these give it a very appropriate decoration. Picture 4 is a similar hanging pot surrounded by virgin cork, which can be purchased cheaply from most seedsmen. The virgin cork is simply placed around the can, and a few thin wires tied around the whole body to keep it in place.

4. Tin can flower-pot covered with virgin cork

Picture 2 shows a hanging flower-pot of a different shape. Here two round tin cans have been slid into each other after having had a space cut out of the side of each. The bottoms of the two cans form the ends of the cylindrical pot.

For out-of-door flower-pots, for ferneries and rockeries, and for flower-stands the tin can flower-pot can easily be pressed into service by anyone who has a little ingenuity, and who has learned how to prepare the simple flower-pots we have described.

Before putting in the earth, we should put broken crockery in the bottom of the cans about two inches deep. Then the earth is put on the top. If the pots are used in a room, we should take them to the pantry or bath-room when we wish to water the flowers, and after watering them it is well to allow them to drip for half an hour before replacing them in the room.

THE VANISHING PILLAR TRICK

VERY simple materials are required for the performance of this very effective trick. The pillar is a block of solid boxwood, a little over 2 inches in height and shaped as A in picture 1. With it is used, unknown to the company, a little cap, B, of the same material, and of such a size as to fit closely, but not tightly, on the rounded top of A. Whether B is on or off, the appearance of the block is the same.

When you desire to show the trick, you secretly tuck B between the roots of the first and second fingers of the right hand, convex side inwards. Exhibiting A, you invite the company to assure themselves that it is just what it appears to be, a plain solid block of wood. When it is given back to you, you take it in the right hand, and in so doing slip the little cap over its upper end, and show both together, as being merely the block which has just been examined. You then take them in the left hand, small end uppermost, curling the thumb and forefinger round B, as seen in picture 2, but leaving it still visible, so that, to the eye of the spectator, the block as just seen is still in the hand. As a matter of fact, however, in withdrawing the right hand you carry off the block with it, and drop it into a convenient pocket. You now announce that although the block is made of boxwood, which is one of the hardest woods known, you can, by the aid of a little magic, compress it so as to reduce it to half its size, or even less. Suiting the action to the word, you bring the hands together, and make a pretence of squeezing vigorously. Under cover of so doing, you insert the tip of the little finger of the right hand into the cap, which thenceforth remains on it, thimble fashion. Still keeping up the squeezing movement, you say: "It is getting smaller, smaller, smaller. I have made it so small that it has disappeared."

1. Pillar and cap

Opening the hands, you show that they are empty. The boxwood cap is, by artificial light, so nearly the color of the hand as to be practically invisible, and if the hand be kept in gentle motion the keenest eye will not detect its presence.

2. Holding the cap

If the cap be found too loose a fit for the little finger, one of the other fingers may be used instead. The first attempts of the novice at practising the trick will quickly show him what suits him best in this particular. The block and cap can be purchased for a small sum.

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO AT THE END OF SEPTEMBER

SEPTEMBER is a terrible month for weeds, therefore the hoe must be used so frequently that they never attain to their flowering and seeding stage. Really, weeds are very little trouble if they are attended to while quite small. We must remember that not only are weeds unsightly when growing among our flowers, but also that they are depriving our garden plants of a portion of the goodness and nutriment of the soil.

If possible, we should begin our autumn planting about this time. To find room for it we may uproot any *annual* plants that have finished flowering. Even if left, they would die before the winter, so that if their beauty is gone, they are better taken away, for they, too, are using up the goodness of the soil.

Probably you sowed the seeds of sweet-william, canterbury bells, and perhaps forget-me-nots, and now have a quantity of young plants that, during the summer, you have been growing in some spare piece of ground or even in boxes. All of these may be planted in your little plots as soon as you can find room for them, and they will make the plots bright and beautiful next spring. The polyanthuses, too, if these were removed to make more room for your summer-flowering plants, and have been kept growing in some cool, moist spot, may all be brought back at the present time, and replanted in the little gardens. At this season you will scarcely need to water your plots at all, for beside the rainfall there are heavy dews night and morning, and these give quite sufficient moisture at this season, but pot-plants will need regular attention, though even they will require less water than was necessary a few weeks ago. The chief thing to aim at now, so far as the appearance of the little garden goes, when everything is getting rank and overgrown, is neatness—plants may need an extra tie to keep them from overhanging and invading others. Edges should be kept clean and very tidy, and plants may even need reducing somewhat to keep them within bounds.

There is a very delightful bit of autumn gardening that awaits us now, nothing less important than the planting of the bulbs out of doors. Here in America we are often tempted to put the work off until November is half through, and even later than that; but in Holland, the great land of bulbs, they do the work quite early. We can easily see the wisdom of thus taking time by the forelock, as the good old saying has it. If we take up a bulb that has been in the ground ever since it flowered in the early spring—a snowdrop, let us say—and examine it at the end of August, we shall see that already it has made quite a considerable quantity of roots; it is growing quietly and slowly through the long months that lie ahead of it before it is due to flower. If you shorten this period of quiet growth by many weeks, you cannot expect sturdy plants.

There is another point also to consider. The bulbs we buy at this season have been removed from the soil for a long time already, and it is well known that some varieties deteriorate if kept out of the ground more than a certain time. With all these things in favor of early planting, we find the wisdom of "taking time by the forelock."

In these days nearly every kind of bulb is much cheaper than it was some years ago, and it would seem that every season they grow cheaper. It may help you if I show what three dollars will procure in bulbs for autumn planting during the next few weeks.

One hundred crocuses, mixed colors, for 60 cents. Fifty pheasant's eye narcissi for 50 cents. One dozen fine double daffodils for 50 cents. One hundred Spanish irises for 30 cents, mixed colors. One dozen alliums, yellow flowers, for 25 cents. One dozen fine mixed parrot tulips for 15 cents; and one hundred French ranunculi for 50 cents, mixed, and beautiful Japanese lilies, called Lilium Speciosum, for 25 cents each. One should also have some lilies-of-the-valley for shady places, and one or two of the tall crown-imperials.

There! with numbers such as these, who would not save up pocket-money to have a fine show of bulbous plants?

As soon as the space can be found for them the other bulbs may be planted, but the ground should be dug over first. It is a very bad method to use a pointed stick, or, indeed a stick at all, with which to make the holes for the bulbs to lie in. A trowel or little fork should be used, because, in the case of the stick, there may be left a space between the base of the bulb and the bottom of the hole, and this is not at all to be desired—*the base of the bulb must be quite firm on the soil.*

Some people take the precaution of putting sand in the hole for the bulb to lie on, but, except in cold, wet soil, it is unnecessary for the hardy bulbs mentioned above. It is not difficult to determine how to place the bulb; the flatter end should lie downwards. There is an interesting method of growing bulbs, and especially hyacinth bulbs, in water. Single varieties should be chosen, and the water in the hyacinth glasses should be rain-water, just touching the bulb. The water should be changed occasionally and should be filled up as it diminishes. Add charcoal to keep the water sweet, and keep the bulbs in the dark.

HOW TO CARE FOR GOLDFISH

OF all the pets, these golden fishes are apt to suffer most from neglect. They have no way of calling attention to their troubles except by hanging like tassels from the surface, where the air contains most oxygen, their sides heaving with the efforts of the gills, while the fish pant loudly, poking their noses quite out of water. Children forget to change the water, or to feed them, and are surprised when they find them floating upside down some morning, quite dead.

Among the most common causes of death are too little water and too small quarters, and too much sun also. This explains why picturesque globes should be avoided, or at any rate kept out of strong sunshine, for the curved sides collect the sun's rays and fairly scald the helpless fish. An oblong tank, made of one piece of glass, is easy to handle when empty, cannot leak, allows one to see the fish clearly, and does not break unless roughly handled. One holding about three gallons is of a handy size in which several fishes two inches long may have swimming-room. Other aquaria, made of plain pieces of glass, on at least two sides, fastened together with wood or metal at the corners, are not so easily handled and are apt to leak. The cement used must be carefully chosen or when dissolved by the water it will poison the fish.

Whatever may be the form of tank chosen, it must be absolutely clean, and every trace of soap rinsed away. The carpet of sand also should be thoroughly washed and should not be that from the seashore, which is hard to rid of salt, but from bank or fresh-water stream. A little soil, also cleaned, may be used if well covered with sand, but is scarcely necessary, as the aquatic plants which we are going to insert need nothing but water.

These plants, growing in sunshine, exhale oxygen. In warm weather one can often see the leaves and stems beaded with silvery drops of gas which continually disengage themselves, and rise to explode near the surface. This oxygen, freed in the water, is absorbed by the blood of the fish as it flows through the gills. The carbonic acid gas which is thrown out by the fish, is essential to the growth of the plants, which seize upon it throughout their whole surface, assimilate the gas, and decompose it, extracting the carbon, rejecting the oxygen. This is done by the green parts of the plant containing chlorophyll, rendered active by light, and most so by sunshine. Tiny pores, or stomata, allow the rejected oxygen gas to escape from the cellular tissue, to be captured by the fish, as we have seen, thus completing the circle of usefulness.

Given plenty of plants to furnish oxygen for the animals; enough water to store it in (about a gallon for each fish); enough animal life to void carbonic acid gas to supply the plants; and with sunlight to act as motive power, one can readily see that the water in the tank should remain in perfect condition and the whole affair be "balanced," as in a natural pond.

Aquatic plants may be bought from florists or dragged from brooks and ponds. The water from which they are taken must be pure, not containing sewage or dead fish, for deadly poisons may be carried in this way. Several kinds are suitable for aerating the water. A common one is the water-thyme, or Anacharis, a long weed with whorls of small simple leaves, growing rapidly. Frail horn-worts with thread-like foliage stream down the currents, and skeleton-like Characeae lie in quiet eddies. Small pond-weeds, the tiny duckweeds, which float in a green scum on ponds, the long narrow leaved tape-grass that swimmers dread, but which is one of the best air-giving plants a tank can have, and, in fact, any plant found growing in a stream will add beauty and profit to the tiny pond we are building. While we are searching for plants we may also look up some snails. Generally some will be found in shallow quiet streams or even ditches, crawling on stones or grasses. Their shells are very fragile and must be fingered gently, and they must immediately be put into a pail or jar of water. The plants will do better, too, if they can be dropped into water. If they are not wrapped up, at least, they will dry into strings.

Water-Thyme (Philotria Canadensis)

Plenty of snails should be taken (or if none can be found some pretty round fellows can be bought of the fish dealers), for fish like a change of diet and will probably drag the snails out of the wide doors of their shell-homes and eat them. They are very necessary, for they clean up all sorts

of minute plants and animals in our artificial pond, just as they do in the real one. We shall see them painstakingly wiping off the scum on the glass sides of the tank as they crawl over them with slow-dragging "feet," working their rasping tongues at the same time. They will also lay eggs in

A little pond weed

masses of jelly, but if the fish find them out none of the tiny snails will escape.

When all this plunder has been carried home it should be put into water with a hint of salt, and allowed to soak for a while, then rinsed. The cleaned sand is placed in the bottom of the tank, and some of the biggest plants are anchored in it along one side. This will be the back of the aquarium—a background for the golden captives. Little pebbles and smaller plants may also be put in, leaving a clear playground for the fish, then some water may be added with a sprinkling-pot. We then see how much air is forced under the water in this way. The plants will float out and we can rearrange them if we like, for they are more easily managed than when they fell over limply. Finally the tank, which, by the way, should be in the position where it is to stay,—the best place being in an eastern window not too close to the glass for fear of frost in winter, and where the morning sun can cover it for a few hours,—may be filled with water. It is then too heavy to move.

The snails can now be slipped in and the whole thing left for a few days. The early morning sun will start the plants a-growing, bubbles will rise to the surface, and soon we can put in the fish themselves. If the tank cannot be in an eastern window a southern one is probably the best, although during the hot hours in summer the sunshine must be cut off or the fish will faint and perhaps die. In fact goldfish stand cold much better than they do heat, and the best time to start an aquarium is in the fall. Oxygen seems to escape more quickly in summer than in winter, but of course the plants will not grow so well when the sun is faint.

Although, if we are successful, we shall not need to change the water in this "balanced" tank, we shall want to clean up the refuse that collects at the bottom of the tank. This is best done with a siphon, or long tube, one end of which is in the water while the other hangs lower. We suck the air out of this latter end and the water rushes in to take its place, and keeps running as long as the two ends remain the same or until something fills the tube. The lower end must be so placed that the stream through it will fall into a dish. A little experience will enable us to steer the end that is under water over the soft heaps of dead foliage and rejected food that lie in corners and hollows behind plants, especially in the morning before the fish have stirred them up. It is amazing to see how quickly this refuse disappears into the tube and how easily the sand can be left in the tank (if the tube is not more than a quarter of an inch wide). We must be careful to avoid pulling up the plants, however, or jerking innocent snails out of their shells. The siphon's current is surprisingly strong, and would doubtless pull out a fish's eye, or injure its tail, so that the fish must be carefully avoided. They, fortunately, usually scurry away when they first feel the tugging water at their fins.

So much water is pulled out by the suction that the amount left in the aquarium is naturally reduced, and one may wipe clean the exposed glass, before replenishing it. In this way the water is really constantly changed, without disturbing either plants or fishes. In summer, nevertheless, the water should be still more frequently aerated, by lifting it out in handfuls, and dropping it back, in splashes. Warm water parts with its air more easily than cold water does, and the fish are grateful for the air absorbed by the fountain-like spray.

A moss-like water weed

When handling goldfish, it is well to remember that their scales are a valuable protection for them, and that a weak spot in their armor may mean a chance for a deadly fungus to insert itself. The slime further protects a fish from injury, oozing out of

its skin; and, if possible, should not be rubbed off. A little scoop-net is generally used in shops for removing the fish from large aquaria, but I have found the hand to be the safest instrument, especially for the fragile-finned varieties.

There is an insidious fungus disease, flourishing on dying fishes, which attacks

Tape-grass (Vallisneria Spiralis)

weak or wounded fish, and gradually destroys them. It is this fungus which we are endeavoring to keep out, when we scrub everything so vigorously, and which we dread when bringing in new fish or plants. Such should really be quarantined. The disease manifests itself by pale patches on the fish's scales, looking rather furry, and it sometimes covers the eyes with films, or eats away the fins and tail. If this horrid disease appears in the aquarium, everything but the fish must be thrown away, and they must be slid into a shallow bath of salt water—one teaspoonful of salt to a gallon of water. The snails, too, if one wishes to save them, must go with the fish, and there all will have to stay until they are clean again or die, which is more probable. The tank itself will have to be scoured anew. It is best to buy fish from reliable dealers only so as to avoid getting this disease, if possible.

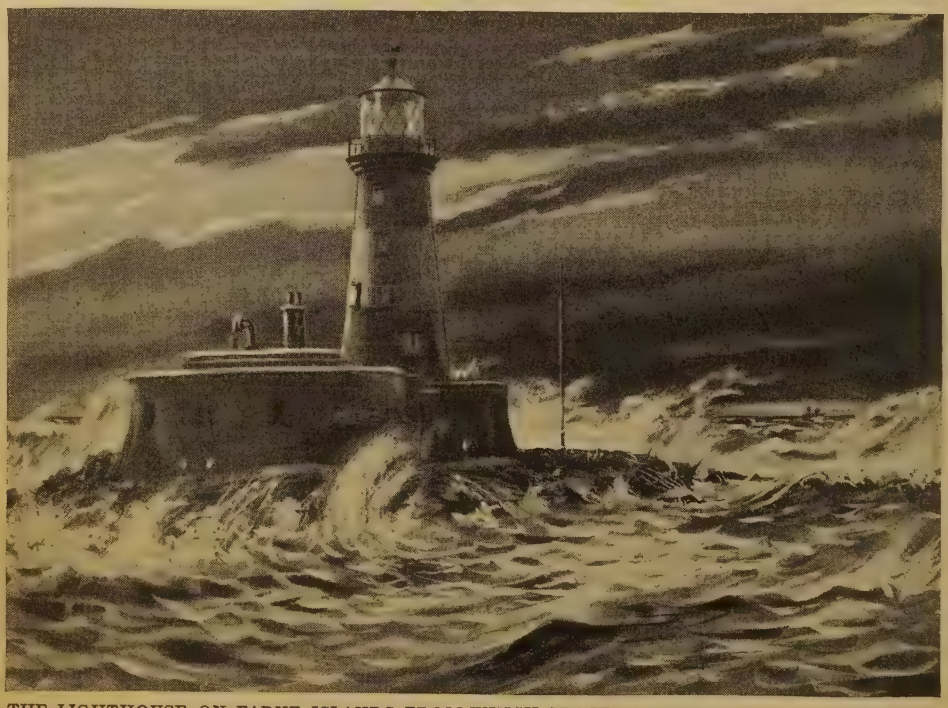
There are many lovely varieties of gold-fishes, some having long and broad filmy tails that mermaids must covet, and it seems better to keep them in a tank by themselves. For one reason they feed chiefly on vegetable food, although many of the prepared foods contain insects or their eggs, and I suspect some of them also contain crushed dog-biscuit. Breadcrumbs are often fed to them but are likely to melt in the water and render it unhealthful. In fact we must be very careful to give them only tiny portions of food and once a day is often enough, for they do not like left-over food and it may foul the water, when it rots behind the plants.

When the sun starts the plants to growing in spring we may find the water growing green and thick. This is because millions of tiny water-plants too small to be seen without a glass are also growing there. They are really a sign that the water is pure, but the water does not look nice and the fish seem to have difficulty in swimming and become scarcely visible. Although they probably like their green shadowy home, we do not, and therefore we shall take out more water than usual when we clean up, and put back plenty of it, cold and clear. Generally the green gradually disappears, especially if we shade the tank during the heat of the day. At any rate the water will clear in the fall. So long as the fish are swimming quietly around, the plants are growing nicely, and no bad odor arises from the water we may assume that everything is all right and leave the fish and tank alone. They will do much better if the tank is never touched except for cleanliness' sake.

Sometimes we find that we have specimens of both sexes of fishes in our tank, and rarely, if conditions are to their liking, the female will lay eggs. These are globular and translucent affairs, and catch like seed-pearls on all the plants. The male, who is never so gorgeously tinted as at this time, also wears white furry spots, and throws out a milky fluid, for the purpose of fertilizing the eggs. This "milt" however sadly fouls the water, so that after the egg-laying is finished, in a day or two the tank must be emptied and refilled. If we want to raise little gold-fish, we must quickly take the eggs out on their sprays of water-weeds, and establish them in a little aquarium by themselves, for the parents otherwise will nose them out and eat them up, precisely as they do the egg-masses that snails patiently deposit on the tank-walls. If we keep the little tank and its plants where it will get plenty of sunshine in the morning, but not so much as to over-heat the water, we may find some queer little squirming forms, all eyes, wriggling about. They will snap at the minute bits of hard-boiled egg-yolk, crushed fine, with which we feed them, but so much will be wasted that the water must be changed every day, to get rid of the decaying food. We must be careful that the fresh water be no colder than that taken out. If everything goes well we may raise some funny little finny creatures, which will eventually eat their parents' food and grow to their parents' size.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 1849.

THE HEROINE OF LONGSTONE LIGHTHOUSE



THE LIGHTHOUSE ON FARNE ISLANDS FROM WHICH GRACE DARLING ROWED TO THE WRECK

Grace Darling was one of the bravest girls who ever lived. Her father kept the lighthouse on Farne Islands, where, in the stormy night of September 6th, 1838, the steamer Forfarshire was wrecked. Through that bitter night nine men and women clung to the wreckage as it tossed on the rocks, swept by the waves and buffeted by the storm. In the morning, as soon as it was light, Grace Darling mounted the lighthouse tower with the telescope. On the rocks in the raging sea she saw the wreck. She launched the lighthouse boat, and, with her father, rowed through the storm to where nine people were in peril of their lives. They reached the wreck and brought the sufferers back in safety to the lighthouse.

WHAT THESE STORIES TELL US

WE read of many kinds of heroism in these stories. The first tells us of a girl who made her name ring through the world in a single day—Grace Darling, who faced an angry sea and risked her own life to save the lives of many who were perfect strangers to her. We read again of a boy who saved the whole of his family by bearing pain bravely. Another story tells us of a faithful Chinese servant who saved his mistress and her child from the hands of wicked men, and starved himself to give them food; and still another tale is that of a merchant who saw a man drowning and jumped into the river to save him, to find that he was saving his own son. Such stories help to make us brave, and to understand the goodness that is in the world.

THE HEROISM OF GRACE DARLING

CONTINUED FROM 1073

A FAST rising storm overtook the steamer Forfarshire as she reached the open sea off Spurn Head on September 6th, 1838, on her way from Hull to Dundee.

In the fairest weather this ship, with her leaky boilers, was none too safe, but as the storm gathered in fury, and she rolled and tossed amid the mountainous seas, her boilers were strained, and great rents were made in her sides, through which water poured and put out the fires, making the vessel unmanageable. The crew tried to use her sails, so as to keep the ship out at sea, but they were quickly blown to shreds. As night fell, they tossed and drifted in the dark at the mercy of the storm, and at midnight the great Farne light, off the Northumberland coast, was seen, warning them of their terrible danger. For at this point rocks that go down a hundred fathoms deep lie off the coast.

Upon these rocks the ship, with her terrified crew, was dashed and cut in two. The stern sank in deep water with over forty souls; whilst the bow, with nine sailors and passengers clinging to the wreck, was fast on the rocks, swept by the waves and buffeted by the storm.

It is easy to imagine their terror as they clung there, waiting for the dawn and praying for help. As the dawn broke they could see, a mile away, the Longstone lighthouse, built on the outer island of the group, where a weather-beaten old sailor, named Darling, tended the lamps, living with his wife and his daughter Grace. Neither of these three had slept through the night, for the waves had been thundering upon the rocks and dashing over the lantern high above the sea.

When it was light enough, Grace mounted the lighthouse tower with the telescope. Far away in the raging sea were the nine poor souls clinging to the wreck. Knowing full well that, with a rising tide and the storm still growing, they must perish, the brave girl determined to try to save them. Her father and mother tried to persuade her not to go out to what seemed certain death, but she said: "If father will not go with me, I will go alone." Seeing that she was so determined, her mother helped to launch the lighthouse boat, in which the brave girl and her brave father rowed towards the wreck and the men who were in such dire peril of their lives. Undaunted by danger, battling with the winds and the angry waters, they at last reached the wreck, and brought the sufferers back in safety to the lighthouse.

The story of Grace Darling's heroism spread quickly through the country and through the world. Generous people sent money and presents to the brave girl, whom many people came long distances to see. But she lived only four years after this to enjoy her fame and good fortune, and when she died they laid her to sleep within sight of the scene of her golden deed.

THE MAN WHO SAVED HIS SON

A FRENCH merchant named Labat was taken ill in the early years of the last century, and retired to a beautiful country house on the banks of the River Adour. Here, one morning, his gaze was attracted by a rider struggling with a restive horse on the opposite bank. The old merchant, who was wearing a dressing-gown, peered across the distance, and watched the battle between man and horse with anxious eyes. Suddenly he was horrified to see the rider hurled violently from the back of the plunging horse, and thrown into the river.

The merchant never hesitated. He forgot his age, his illness, his comfortable house, his own safety, and, hurrying down, he dived in after the drowning stranger. Such is the call of Humanity.

He was a good swimmer, but the heavily-booted horseman was hard to save, and it was only after a terrible struggle that the merchant succeeded in bringing him safely to shore.

Then, with a cry which must have startled the morning echoes, the grand old merchant exclaimed fervently:

"Sacred Humanity, what do I not owe you? *I have saved my son!*"

THE SERVANT WHO SAVED HIS MISTRESS

ON a small island off Australia, inside the Great Barrier Reef, North Queensland, an Englishman was one day obliged to visit a distant town for supplies, leaving his wife and their baby in the care of their Chinese servant.

While he was away, the servant came in great alarm, saying that the natives, who were very fierce and cruel, had come from the mainland, and were marching down the island towards their house. What could be done? There was no hiding-place on the little island, and the master had gone away in the only boat. The Chinaman hastily launched a huge copper vessel used for cooking, helped the woman and child into it, and, taking a jug of water and a little food, paddled away to an uninhabited islet, three or four miles distant. From there they saw the natives destroy the little house.

So long as she lived the woman kept a diary of events, writing how the Chinaman made them as comfortable as possible, and how finally, after many days of denial, he went off by himself and hid in the bush, where later he was found, starved to death, wrapped in his old ragged quilt.

Alas! before help came, the mother and her babe died, too; and all were found, with the diary that told the story.

THE BOY WHO SAVED HIS FAMILY

ABOUT two hundred years ago, the Huguenots, who were the Protestants of France, were being bitterly persecuted for their religious beliefs. In the village of Thorigne lived a weaver named Daniel Bonnet. He had a wife and three children, the youngest being a little boy of five years old.

As they were Huguenots, suffering great hardships, they decided to leave France and go to America, where they would be free to worship God as they liked.

When all was ready they started off; but in order to get away safely they put their three children on the back of a donkey and covered them over with vegetables. Then they set off as though they were going to market; for if it had been known that they were leaving France they would have been stopped.

Not long after they had left the village, one of the soldiers saw them, and, suspecting that they had hidden their children under the vegetables, he rode up and said with a sneer: "Going to market, are you? Then I will try if your carrots are tender." With that he drove his sword into the load on the donkey's back with all his might, but, hearing no sound, he thought he had made a mistake, and galloped off.

We can imagine the agony which the poor parents felt. They dare not stop to see what had happened, but had to go on until they were far away from everyone, and out of sight. When at last they took off the vegetables, they found their little boy had been stabbed through the thigh. The little fellow looked up at them, and said with pride: "But I did not speak, mother," and then fainted away.

Thanks to his courage, the family were able to escape across the sea, and to found a new home in a happier land.

THE NEXT GOLDEN DEEDS BEGIN ON PAGE 1810.

THE GREAT STORY-TELLERS

WRITERS OF THE SEVENTEENTH & EIGHTEENTH CENTURIES

CONTINUED FROM 1683

MEN and women had been telling stories long before any of the writers we are going to hear about were born. But it was not until the beginning of the eighteenth century that the art of telling a long story in the form of a novel began to be practised by English writers. On page 1223 we read about "Robinson Crusoe," which was first published in 1719, and this was really the beginning of what we may call modern story-writing. As we know, that immortal story was written by Daniel Defoe; but when he was a youth of seventeen there was a rough preaching man in gaol at Bedford, who was occupying his time in writing a story of a very different kind, which has made his name even more famous than that of the author of "Robinson Crusoe."

This man was John Bunyan, and we have read all about the wonderful story he wrote in the STORY OF FAMOUS BOOKS on page 1125. There were many story-writers before John Bunyan, who, like him, told their tales in the form of allegories; but we need not concern ourselves with them. Bunyan is the first story-teller born in the seventeenth century to whom we need pay attention.

What sort of man was he, we may ask ourselves, who wrote the wonderful "Pilgrim's Progress"? When we turn to his great book we find it written with so much grace of language and beauty of thought that we might suppose its author to be a scholar of wide experience and culture did we not know that his father was only a poor tinker, or mender of pots and pans, and that he himself had followed the same trade.

He must therefore have been what is sometimes called "one of Nature's gentlemen," for of education and training in the gentle habits of life and thought he can have had none at all. Indeed, we know for certain that in his youth he was rough and thoughtless, wasting his time like most of the heedless village youths of his acquaintance. The descriptions of him, and his familiar portraits, show him to have been strong and lusty, and not exactly the style of man whose heart one would have expected to be tender with love for his fellow-men, his soul simple and steadfast for truth and righteousness.

Bunyan was born in the year 1628, and seventeen years later he left his pots and pans for a time to serve in

the army, returning in about a year to his native town of Elstow, near Bedford, where, soon after he was twenty years of age, he married a poor girl about whom we know very little, except that she died in 1665 and left her sorrowing husband with four little children.

JOHN BUNYAN, THE ROUGH PREACHER WHO WROTE "THE PILGRIM'S PROGRESS"

Perhaps it is to this almost unknown wife of his that something of his fame is due, for if before his marriage he had led what to him seemed a very rough life, soon after it he began to sober himself and to think deeply about religion. His wife had brought him nothing in worldly goods, but among her few poor possessions were two religious books of the time, the reading of which turned his thoughts to better things, and may possibly have given him the idea of his own later writings.

Bunyan began to go to church regularly, and soon felt himself compelled to preach the Gospel that had now brought so much peace to his troubled mind. This was in the days of the Puritans and the Commonwealth; but no sooner had the unworthy King Charles II. come back to the throne than preachers who did not belong to the State Church were subjected to the cruelest persecution, and in 1660 Bunyan was arrested and thrust into the county gaol at Bedford for no other offence than the crime of preaching the simple truths of the Gospel.

For twelve long years was he kept a prisoner. Yet his time was not wasted, for during those years he contrived to write many religious works, and particularly one, called "Grace Abounding," in which he tells us his inmost thoughts in a way that no other Englishman has ever revealed himself.

HOW THE TINKER'S SON BUILT UP HIS FAME IN BEDFORD GAOL

When he was liberated, in 1672, he became a licensed preacher, and was chosen as the pastor of the church to which he had belonged. Three years later he had to suffer imprisonment in the town gaol of Bedford, but for six months only, and it was now that he wrote the first part of "The Pilgrim's Progress."

No persecutions could destroy his faith in the true Christian religion, the preaching of which by tongue and pen had been his one thought from the time that he had given up his rough life. The fame of his great book in his own day was immense, and when he died, in 1688, during a visit to London, the tinker's son of Elstow had done more than all King Charles' bishops to turn the thoughts of the people to God. Though he has been dead for two centuries and a quarter, his voice still speaks to us in "The Pilgrim's Progress," which has been translated into more than eighty foreign languages.

Daniel Defoe, the author of the immortal "Robinson Crusoe," is another example of the fact that humble birth is no bar to the greatest achievements. His father, whose name was James Foe, was only a butcher in the parish of St. Giles, Cripplegate, London, and Daniel, who did not alter and dignify his family name until he had reached middle life, was intended to become a minister of one of the Dissenting churches, and at the age of fourteen he went to Newington to study.

THE SCHOOLDAYS OF THE MAN WHO WROTE "ROBINSON CRUSOE"

There he learnt Latin, Greek, French, Spanish, and Italian, in addition to the usual religious studies, for he was an extremely bright and receptive scholar. But despite all these accomplishments he very soon changed his mind, and instead of going in for the ministry, decided to become, of all things, a hosier. This was when he was twenty-four years of age and before he had begun to write.

It is rather difficult to imagine the author of "Robinson Crusoe" in the shop of a London hosier, supplying customers with stockings. But he had a soul above hosiery, this brilliant scholar and fiery politician, who could not well keep silent in those days when so many public abuses had still to be remedied.

That was the great age of the pamphleteers, or writers who addressed the public on questions of the day in small pamphlets, which were sold in the streets, as the newspapers with which we are now so familiar were small and few in number. So when Daniel Defoe wanted to tell the public something which was burning in his own mind he wrote and printed a pamphlet, and it so happened that one of these pamphlets was considered to contain a libel on the Govern-

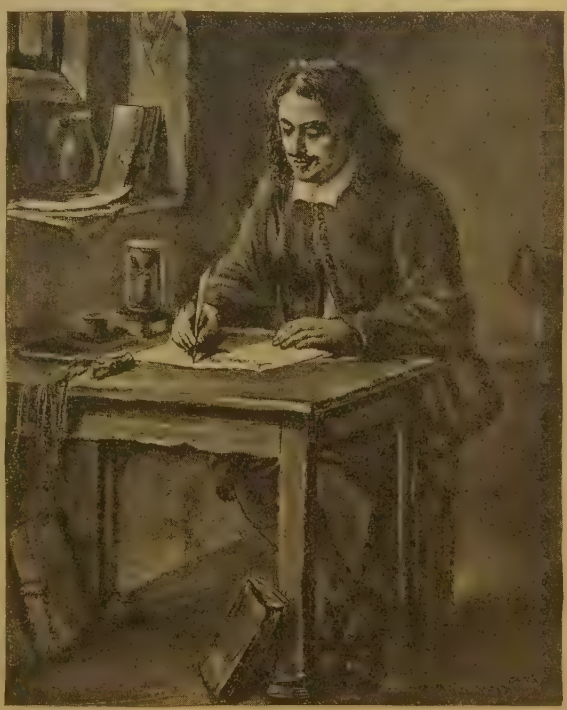
ment of the day. It certainly spoke very freely about the manner in which the Church of England was conducted, and voiced the opinion of a great many people in England.

For the writing of this outspoken pamphlet Defoe was made to stand in the pillory, but the people, who sympathised with him, made his intended punishment an honor by decorating the pillory with garlands of flowers; and, fortunately for him, the authorities did not proceed to the extreme measure of cropping his ears—a punishment which happily for him had ceased to be inflicted upon political prisoners who were sentenced to stand in the pillory.

It was in the year 1702 that he made his memorable appearance in the pillory, and two years later we find him a prisoner in Newgate Prison, where he had been lodged by his political opponents, who were then in power. Being a man of boundless energy, he did not sit idly in prison. He seems to have been allowed a certain amount of liberty, for during his stay in Newgate he actually began to publish a weekly paper, in which, in the most fearless manner, he continued to attack the policy of the Government of the time, and to support the Protestant cause in the face of all its enemies.

For about thirty years before his death, which occurred on April 24, 1731, in the seventieth year of his age, his pen was never idle in writing of some kind. Even if all his histories and essays and satires were to be forgotten—as, indeed, most of them are likely to be some day—the name of Daniel Defoe would never grow dim, for the popularity of "Robinson Crusoe," is bound to keep it bright for ever. He was the first great story-teller who made use of the natural form known as the novel, now so popular, and when he died, in 1731, he was buried in Bunhill Fields, where, forty-three years before, John Bunyan had been laid to rest.

BUNYAN WRITING HIS STORY IN PRISON



John Bunyan was a preacher in the time of Charles II., when all religious teachers who did not belong to the State Church were subject to cruel persecution. Bunyan suffered twelve years imprisonment for daring to preach the Gospel, and later, when imprisoned for six months in the town gaol at Bedford, he wrote the first part of his most famous book, "The Pilgrim's Progress."

In the course of time the old tombstone over Defoe's grave became broken, and the lettering obliterated. It was a happy thought when, not so many years ago, a London newspaper appealed to the boys and girls of England to subscribe for a new monument to the memory of the writer of the most delightful of all the stories a boy or girl may read. As a result of this, a handsome Egyptian pillar was erected in place of the broken old tombstone, for the boys and girls who had enjoyed reading "Robinson Crusoe" were only too delighted to take part in this humble service to the memory of its immortal author.

Although all boys and girls love Daniel Defoe's famous story, it is doubtful whether they would have loved the man himself. He was so keen a fighter with his pen, and so devoted to his literary work, that he probably had very little time to make himself agreeable to his friends, and especially to the little ones. But we are certain that few boys and girls could have loved Jonathan Swift,

the next great story-teller to be born in the United Kingdom.

We have already read about Swift's famous book, "Gulliver's Travels," on page 1333. As we there read, he was a great writer of satire. Now, to be satirical one has always to be looking for the faults of others, and that is not the way that leads us to the love of our fellow-men. Swift spoke very bitterly of most people, and, on the whole, was not a very agreeable companion. But for all that he was a remarkable man, full of imagination, a great writer, and, in short, what we call "a genius."

THE LIFE OF JONATHAN SWIFT, WHO WROTE "GULLIVER'S TRAVELS"

Jonathan Swift was born in the city of Dublin, on November 30, 1667, his parents being of good family, but his father died before Jonathan was born, and his mother was left very poor.

He must have been a winning little boy, this fatherless Jonathan, for his nurse loved him so much that she took him away with her when she went to live at Whitehaven, and kept him for three years. So well had she looked after him and guided his infant mind that when he was again restored to his mother he was quite the cleverest little boy one could imagine. Before he was five years old, we are told, he was able to read any chapter in the Bible.

As Jonathan's mother had relatives of rank and wealth, he was not without help when he needed it, and the lad was sent to Dublin University at fourteen years of age and later to Oxford. There is nothing that one can say in favor of his university days. He seems to have been, on the whole, a very bad student.

When he was twenty-seven years of age he became a clergyman in Ireland, and except for some four years he continued to discharge the duties of a clergyman to the end of his life.

THE CLOUDED LIFE OF THE MAN WHO MADE THE WHOLE WORLD LAUGH

In was in April, 1713, that Swift was appointed Dean of St. Patrick's, Dublin, and thirteen years later he wrote "Gulliver's Travels." More than twenty years before that he had written two famous books—"The Tale of a Tub" and "The Battle of the Books."

The romance of his life was connected with a lady called "Stella," whom he had known as a very young girl. Meeting her later when she had grown into a graceful young woman, he fell in love with her. He wrote many letters to her, and one of the books by which he ranks high as an author is his "Journal to Stella," in which his genuine love for the lady is most charmingly displayed.

Many other books he wrote besides those familiar to us—histories, political studies, poems. But while we cannot help admiring the great cleverness of the man, or enjoying to the full the playfulness of his genius in such a work as "Gulliver's Travels," we do not feel him to be so warm a human being as good John Bunyan. It is sad to think that his later years were clouded with the fear of madness; that, ten years after he had displayed so much mirth and playfulness in the story of Gulliver, he began to be so gloomy in his own mind that for the nine remaining years of his life he was often a stranger to happiness. He died in 1745, and was buried in the Cathedral of St. Patrick's, Dublin.

SAMUEL RICHARDSON, THE LITTLE PRINTER WHO WROTE SOME FAMOUS STORIES

A quaint little figure was that of the next great story-teller in those early days to which we have here turned back. He, too, was the son of very humble parents, his father being an ordinary carpenter in Derbyshire, where, in the year 1689, Samuel Richardson was born.

Boys and girls need not be expected to read any of his stories until they have grown up, and even then there is no particular reason why they should read them at all. Still, Richardson bears one of the greatest names in the history of English literature.

Richardson's stories were chiefly written in the form of long-winded letters supposed to be addressed by one character to another. Nowadays our lives are much too varied and active to leave time for reading such very long and unexciting stories as he wrote, but our great-great-grandfathers had more leisure and fewer interesting books, so that they could find time to follow the slow and steady unfolding of his appallingly lengthy tales. Indeed, we may guess how interested they could be in his stories when we are told that in country villages people used to wait anxiously for the arrival of the next part of his novels to find out what was to happen

THE AUTHOR OF "ROBINSON CRUSOE" IN THE PILLORY

Daniel Defoe, who wrote "Robinson Crusoe," was a strong Protestant, and a fearless advocate of the government of the country in the interests of the common people. He wrote many pamphlets attacking the Government of his day, and for doing so he had to suffer imprisonment. On one occasion he was made to stand in the public pillory, but the citizens of London admired him so much that when he was in the pillory they brought offerings of flowers to him, and had to be kept away by soldiers, as we see in the above picture.

to the characters, and when the heroine of his dreary story, "Pamela," was made to marry the rather unmanly hero, church bells were rung in some villages as though Pamela had been a real person!

This is all very strange to us now, for neither that story nor "Clarissa," which he took eight years to write, nor "Sir Charles Grandison," has the slightest attractions for people of our time. These famous books are only interesting as showing how the taste of one generation differs from that of another.

Samuel Richardson had very little education, and at the age of seventeen he was apprenticed to a London printer, who made him work so hard that he had no leisure for reading or study. But he was as industrious as he was honest, and he made up for the time of which his master robbed him by sitting up at night, when he ought to have been asleep, to read any books he could secure. The candles used for these midnight studies he bought himself, so that his master might not have to pay for the convenience of his apprentice.

An unambitious, steady, plodding, honest and industrious, and perhaps a very commonplace young man, was this Samuel, but after fifteen years he had some reward from the printer, as he married his master's daughter, having now become a printer on his own account in a court off Fleet Street, close by the old church of St. Bride. Here he continued for many years to carry on his business like any other printer of his time, living above his workshop, and thus spending most of his time amid the smell of printers' ink. We can well believe that he was a kind and considerate master, and it is said he used to hide a silver coin among the types at night so that the first man to arrive at the workshop in the morning might have it as a reward!

Richardson was not far short of fifty years old when he determined to make himself famous by writing a novel, and

"Pamela" was the result of the little printer's resolution. He certainly succeeded in making himself famous, and, being perhaps somewhat vain of his literary powers—which at the early age of thirteen he had first exercized by writing love-letters for some ignorant servant girls—the remainder of his days were spent with much satisfaction in writing for the sentimental ladies of his time, to whom the languishing and tearful heroines of his novels seem to have been strangely attractive.

THE END OF ONE GREAT STORY-TELLER AND THE BEGINNING OF ANOTHER

The little printer of Salisbury Square, though so few of us read his writings today, certainly gave a great impetus to the art of fiction in England, and the careful and elaborate way in which he traced the natures of imaginary people was also imitated by writers on the Continent, and chiefly in France, where to this day the works of Richardson are in high repute. He died on July 4, 1761, and by his own request was buried in the church of St. Bride, near to which so much of his life had been passed.

When an author invents some unusual way of telling a story, it frequently happens that another author will turn it into ridicule by writing what is called a parody of it. So it happened with Richardson's "Pamela," which an abler and far more gifted man than he, two years after its appearance, took as the idea of a very different sort of story, called "Joseph Andrews."

The writer of this was a born story-teller, a man of great force of character, the son of distinguished parents, and well educated. His name was Henry Fielding, and he was born in Somersetshire on April 22, 1707.

HOW HENRY FIELDING WAS FORCED TO WRITE STORIES FOR A LIVING

Being fond of the pleasures of life, and disinclined to work or to study too closely, Fielding left the University of Leyden, in Holland, and returned to London when he was twenty. But he soon found that his father was not able to allow him so much money as he had expected, and he had to exercize his abilities by writing for the stage.

After a while he married a beautiful lady who had a small fortune; but this he soon contrived to spend, and at thirty-three he became a barrister, though it was chiefly by writing books that he made his living. His wife died in 1743, and he then married a servant, who made him a very good wife to the end of his days. Poor man, he was not long to enjoy the success of the great books he wrote, nor the advantage of the comfortable salary he received from a legal appointment given to him in 1749.

It was in that year that he wrote a very brilliant satire called "Mr. Jonathan Wild the Great," and in the same year appeared his most celebrated novel, "The History of Tom Jones," which is one of the great masterpieces of English fiction. His third and last novel was "Amelia," which appeared in 1751. All his stories are written with a fine vigorous feeling of life, and overflow with humor, a quality in which Richardson was utterly deficient.

In 1754, while on a visit to Lisbon, where he had gone broken in health, he died, and there in the cemetery of the British Factory—for in those days there were many such trading posts under the flag in foreign countries—one of the greatest of English story-tellers and earliest of her novelists was laid to rest.

LAURENCE STERNE AND TOBIAS SMOLLETT AND THE BOOKS THEY WROTE

Laurence Sterne, like Jonathan Swift, whom he resembled to some extent in character, was born in Ireland, though his ancestors were English people of good position in Church and State. He was born on November 24, 1713, and educated at Halifax Grammar School and Cambridge University, becoming a clergyman in the year 1738. For a good many years his life was, no doubt, that of an ordinary English country vicar, except that, being at once satirical and bitingly sarcastic in his speech, thin in appearance and poor in health, he was probably by no means so pleasant a companion as a country vicar ought to be.

When he was forty-six years of age he published at York the first two volumes of his great and amusing book, "The Life and Opinions of Tristram Shandy." Very soon the wit and humor with which the characters in this great work were drawn had made the name of Sterne famous, and for years new volumes of the work continued to appear, until it was completed in the year 1767, just

about two months before its author breathed his last.

On the whole, Sterne was not a pleasant kind of man to contemplate, and although his books are full of high spirits and laughter, it is not always the healthiest laughter, nor are his sentiments such as do credit to a preacher of the Gospel, who during his later years may be said to have written under the shadow of death. His other famous book is called "The Sentimental Journey through France and Italy." It is very witty.

Tobias Smollett was a Scotsman, born near the "Bonnie, bonnie banks of Loch Lomond" in March, 1721. He went to school at Dumbarton, and to Glasgow University, and when he was about fifteen was apprenticed to a surgeon in Glasgow. He wished, however, to be a writer, and at the age of eighteen went to London with a play, which he had written, in his pocket. But no one would buy the play, and as he had no money, he went to sea as assistant to a naval surgeon.

After his return to London he practised as a surgeon, and as he married a lady who had some wealth he wrote for a time more for pleasure than profit. Later, he adopted writing as a profession. He became a journalist, wrote histories and books of travel, translated foreign stories and edited papers. But, above all, he produced three novels very similar in character to those of Henry Fielding, and nearly always mentioned in company with them as the best examples of English novels written before the time of Sir Walter Scott. They are full of interesting and life-like characters, and his sailors especially are the breeziest, saltest sons of the sea to be found in English story-books. The names of his three famous books are "Roderick Random," "Peregrine Pickle," and "Humphrey Clinker," the first being written in 1748, and the last, which is also the best, in 1771, in the September of which year

OLIVER GOLDSMITH AND THE FAMOUS STORY THAT PAID HIS DEBTS

Oliver Goldsmith was so improvident that he was always in difficulties. Once his landlady had him arrested for debt, and when his friend, the great Dr. Johnson, found him a prisoner in his lodgings, Goldsmith showed him the manuscript of a story he had written, and Johnson was immediately charmed with it. He took it out and managed to sell it at once to a bookseller for $300, which enabled Goldsmith to pay his landlady and get rid of the bailiffs. The manuscript was the famous story known as "The Vicar of Wakefield."

Smollett died at Leghorn, in Italy, where he was buried in the English cemetery.

Oliver Goldsmith, like two of the other writers we have heard about, was also born in Ireland, but he came of Irish ancestors. His birth took place on September 10, 1728, and he was in his twenty-first year when he managed, without any great credit to himself, to take the degree of Bachelor of Arts at Dublin University.

How Goldsmith wandered through Europe playing on his flute

In Oliver it is to be feared we have by no means a type of character that can be greatly admired, for he was always doing the wrong thing, and disappointing all his best friends. Fortunately, perhaps, his effort to become a clergyman was unsuccessful, and his determination to come to America brought him no farther than Cork; while some money he got to enable him to study law in London he lost by gambling at Dublin. When he was twenty-four he went to Edinburgh to study medicine, and although everybody liked him, he did nothing of note at the college.

Next he went to the famous University of Leyden, where Fielding had been before him, and there again he lost what little money he had by gambling. In those days it was the custom of English gentlemen to make a tour of the chief towns of the Continent, and this Goldsmith attempted to do on foot and penniless, playing on his flute by the wayside and in the villages to earn a few cents. Surely the "grand tour" had never been so meanly performed.

The author of "The Vicar of Wakefield" in his days of poverty

In 1756 he struggled back to London, the owner of a few cents, a ragged suit of clothes, and a dirty wig. He tried unsuccessfully to make a living as a physician, was at one time a reader of proofs for Samuel Richardson, and also acted as usher in a Peckham school. Then he became what is known as a hack-writer, or a poor scribbler at low pay for any sort of publication that would employ him. In short, he seemed to be one of life's failures; but a book which he wrote about the education of his time attracted some notice, and when he was thirty-one years of age he was employed by Smollett on a paper which that busy writer was editing; while other editors gave him opportunities of doing better work.

Goldsmith was now a busy author, and if he had had as much common-sense as he had genius he might have lived in luxury; but it was not to be, though he had many warm friends. For he was himself a lovable and gentle creature, despite his ugly face, pitted with smallpox, his short and ungainly figure, and his stupidities of speech. His great friend the famous Dr. Samuel Johnson, said of him that "No man was more foolish when he had not a pen in his hand, or more wise when he had"; while Garrick, the great actor of the day, made a couplet about him:

Here lies poet Goldsmith, for shortness called Noll,
Who wrote like an angel, but talked like poor Poll.

No other author whose unhappy lot it was to write so much to the order of publishers has written so well in so many different ways. His famous comedy, "She Stoops to Conquer," is a perfect stage play; "The Deserted Village" gives him no mean place as a poet; and "The Vicar of Wakefield," his only work of fiction, is one of the most beautiful stories in our language.

How the sale of a story saved Goldsmith from an angry landlady

Yet so stupid was the writer of this lovely story that it is said his friend Dr. Samuel Johnson on one occasion found poor Goldsmith arrested by his landlady for debt, and in his desk lay the manuscript of this immortal story, which the kindly doctor took out and sold to a bookseller for three hundred dollars, enabling the impractical author to pay off his debts to his landlady — and to begin incurring new ones; for when he died in his lodgings at Brick Court, in the Temple, London, on April 4, 1774, he was ten thousand dollars in debt.

His story is indeed a sad one, as his life might have been one of complete happiness, for he was gifted beyond most men of his time. But we shall find as we read the stories of great men of genius, whose writings are among our greatest treasures, that they have not always been able to order their own lives wisely and well.

THE NEXT STORIES OF MEN AND WOMEN ARE ON PAGE 1857.

THE WONDERFUL COLORS OF BIRDS

Nature showered beauty upon the humbler creation as well as upon human beings. Some of the birds are as gorgeous as the rainbow, and make wild scenes and commonplace areas radiant with their glory. Some of the finest of the birds are shown here, and the figures under each name tell us their size in life, the length given being in each case the length of the bird measured from point of beak to tip of tail.

The Home of the Weaver-birds.

THE BIRDS OF BEAUTY

CONTINUED FROM 1646

WHEN Alice was in Wonderland, if she wanted suddenly to grow tall or to make herself smaller, all she had to do was to eat a piece of cake or mushroom, or drink something from a bottle, and she at once became the right size. When we think of birds becoming brilliantly colored, or marked like the surroundings in which they live, we think of Alice. But, of course, the case in real life is different from that in the story-book. No bird ever says to itself, "I will make my feathers the color of the rocks and sand in the desert, so that the hawks and eagles shall not see me." Nor does it make up its mind to wear rich and gorgeous plumage. The appearance of birds is brought about by long ages of change, by the slow working of natural laws.

Suppose we have a number of birds living in a place where they have many strong enemies. They cannot escape by fighting, for they are not strong enough. They cannot escape by flying, for their enemies fly faster. The probability is that they will be killed. But if some of the birds have feathers which enable them to appear, when hiding, like the rocks or sand, or like the trees or jungle, it is very likely that those birds will escape.

The birds which have not this advantage will be caught and killed, but the others will live, and the baby birds hatched from their eggs will be like them. It will become part of their nature to seek safety by hiding. Gradually they will become more and more like the scene in which they live. If the change of seasons brings great changes in the character of the foliage, the birds will be able to change their feathers so that they will keep pace, in appearance, with the altered looks of the things about their homes.

That is one way in which Nature enables birds to flourish. But there is another way. It is the way of the female bird to mate herself to the handsomest among her suitors, like the princesses in the story-books; so that each generation of birds in this way tends to become stronger and more handsome. But the hens of gorgeous bird families are, as a rule, neither gay nor splendid, so that they may sit on the nest and hatch the eggs without danger of being molested by their enemies.

The most gorgeous birds in the world are the birds of paradise and the humming-birds. The first of these is, like the bower-birds, a distant cousin of our old friend the crow. Only a naturalist could discover this. To anyone not acquainted with the science of natural history, it would be hard to imagine a greater contrast than that between the crow and the bird of paradise. But then the bird of paradise does not differ more from the crow than one species of bird of paradise differs from another

species. There are nearly fifty different species of birds of paradise, and many of them may claim to be among the fairest of Nature's children. Not only are they beautiful in coloring, but the arrangement of the feathers of some of them is really extraordinary.

THE GORGEOUS PLUMAGE OF THE BIRDS OF PARADISE

There is one called the twelve-wired bird of paradise. Its tail is short and square, but there grow out twelve long, wire-like feathers, or bristles, for they are only the bare stems of feathers which curve round towards the sides of the wings, and give the strangest appearance to the bird. The chief colors in its magnificent plumage are purple-bronze on the head, green and purple and black on the neck, bronze green on the back and shoulders, and emerald green to the edges of the outer wing feathers, with brilliant violet-purple to the rest of the wings and tail, and rich yellow on the breast. This bird is, including its two-inch beak, a foot in length. The long beak supplies the bird with food, which it takes in the form of honey from flowers.

There is a larger bird of paradise than this—the long-tailed one of the mountainous regions of New Guinea, which is over a yard in length. It is colored as richly as the other, but it adds a fan-like arrangement of feathers which rise from the sides of the breast, expanding at their outer ends in brilliant blue and green, while the tail feathers are of a lovely opal blue. Underneath the bird is white, and when it raises the long feathers on its sides and breast into two half-circles, it forms as extraordinary and beautiful a sight as one could see.

THE KING OF THE GAY BIRDS AND ITS WONDERFUL SPRAY OF FEATHERS

The gorget bird of paradise lives in the same region, and is distinguished by a long tail and a velvety arrangement of plumes round the head and throat, of copper color and golden green.

The king of the gay birds is, however, the great paradise bird—a bird half the size of the long-tailed one, but lovely beyond description. The chief color of the body and wings is deep, rich brown, varied by tints of black and purple and violet. The top of the head and neck are colored like yellow plush, while from beneath the eyes and round the lower part of the throat run feathers of emerald green, from which spring deeper green feathers in a band across the forehead and chin. The beak is blue, and the feet are pink.

The most wonderful feature of this wonderful bird is a superb spray of feathers which it erects to cover itself and look its best. These feathers grow out from under each wing, rise into the air, and curve gracefully over in descending plumes, as much as two feet in length. The plumes are of a deep orange color, pale brown at the tip, and they cover the bird as with a cascade of glossy feathers.

When the male birds set out to win mates they gather together in the trees which they haunt, and dance and spread their feathers in the vainest way. On one of these trees, says Dr. Russel Wallace, who studied them in their native home, a dozen or twenty magnificent male birds in full plumage may be seen together. They raise their wings, stretch out their necks, elevate their lovely plumes, and keep them continually vibrating, so that the whole tree is filled with waving plumes in every variety of attitude and motion.

THE BIRD WITH PLUMES LIKE FANS AND A TAIL LIKE A RACKET

We have been speaking of this one as the king of the birds of paradise, but the one that the naturalists call the king of paradise birds is only about six inches in length, and is distinguished by two fan-like plumes on the breast, and a tail of curved feathers shaped at the end like a racket. Its feathers are green, purple, red and white.

Wilson's bird of paradise, another member of this family, named after its discoverer, is almost bare upon the head, over which two narrow tracts of feathers form a cross. The rest of the head is bare, and the skin a deep blue. From its tail grow out two long feathers, which cross, then curve completely, looking like the handles of a pair of scissors.

As we have a twelve-wired bird of paradise so we have also a six-plumed one. The plumes are long, glistening, wire-like growths, springing from the back of the head, and bare all the way up to the tips, where dainty webs of feather appear. This bird has a gorgeous

ruffle, and a tuft of silver feathers upon the beak, which it can cause to lie flat or stand up at will. No pen could describe the glories of these birds. They must be seen. When a zoo is fortunate, it has one or two alive, but they are hard to keep in captivity. We can give them the proper sort of food, for they like fruit and insects and seeds, but we cannot give them their native air and freedom.

"A MEETING OF PARROTS," PAINTED BY STACY MARKS, R.A.

We have seen in earlier stories how birds and animals develop in a special way in particular parts of the world. The wonderful little humming-birds inhabit the warmer parts of North and South America, and certain mountain slopes. For beauty of plumage there is no bird to surpass them. They are as gorgeous as the birds of paradise, but not with the same stately grandeur, for the biggest of them are small, and the tiniest only two and a half inches from beak to tail. Yet they are most wonderful flying birds.

The conjurers rightly say that the quickness of the hand deceives the eye. Well, the humming-bird's quickness simply makes it impossible for the human eye to follow it. It is like the flash of shooting stars. A famous man who has often been near these birds in their native forests has told us how

very difficult it is to see them. While he was watching a flower he suddenly saw something come between his eye and the bloom. It was a humming-bird, but it seemed like a grey blur as it paused for an instant before the flower. There was a look as of four black threads suspending it in the air. This would be the moving forks of the bird's tail. There was a grey film as, like lightning, the bird vibrated its wings; then, with a sharp twitter, it turned. There was a flash of emerald and sapphire light as the sun was reflected by its plumage, and in an instant it had vanished. It all happened so quickly that the word remained unspoken on the watcher's lips, the thought in his mind had scarcely had time to change. Yet in that time the bird had flown to the flower; it had thrust in its beak, shot out its long tongue, and sucked up the honey and insects in the flower; and it had gone to a new flower which would furnish the next portion of its meal.

How the humming-bird hangs in the air sipping honey from a flower

Everybody who has seen the humming-bird in its native wilds gives us the same impression of its marvelous swiftness. No one can see its wings move — they are vibrated too quickly. And it is because of the rate at which they move that the bird makes the humming sound which gives it its name. It lives all day in the air. It is never tired of flying unless it be one of the few species which are more like other birds, and prefer, through weakness of wings, to take its food while perching. Most of the humming-birds feed when flying. This is, of course, the habit of other birds — of the swallow and goat-sucker, for example — but the humming-bird has to hang in the air while sipping the honey from a flower. To do this it possesses wonderful wings for its size.

Birds are supposed to be unable to fly backwards, but the humming-bird is an exception. It can fly backwards for a little way. When it approaches a flower it inserts its long beak, while its body is raised higher than the flower. As it puts in its beak it lets its body sink down in the air, as if it were holding on to the flower by its beak. But it does not; its splendid little wings are working like steam-engines to keep it afloat in the air. When it has sipped such honey as the flower contains, it raises its body again, withdraws its beak, and then flies out backwards, and darts away like a flash.

Some of the humming-birds can turn right round in the air with a single motion; some seem to dance in the air, while they can all dart from side to side in a manner such as to make the swallow, which they most resemble, seem slow and commonplace.

The five hundred kinds of humming-birds & their remarkable powers

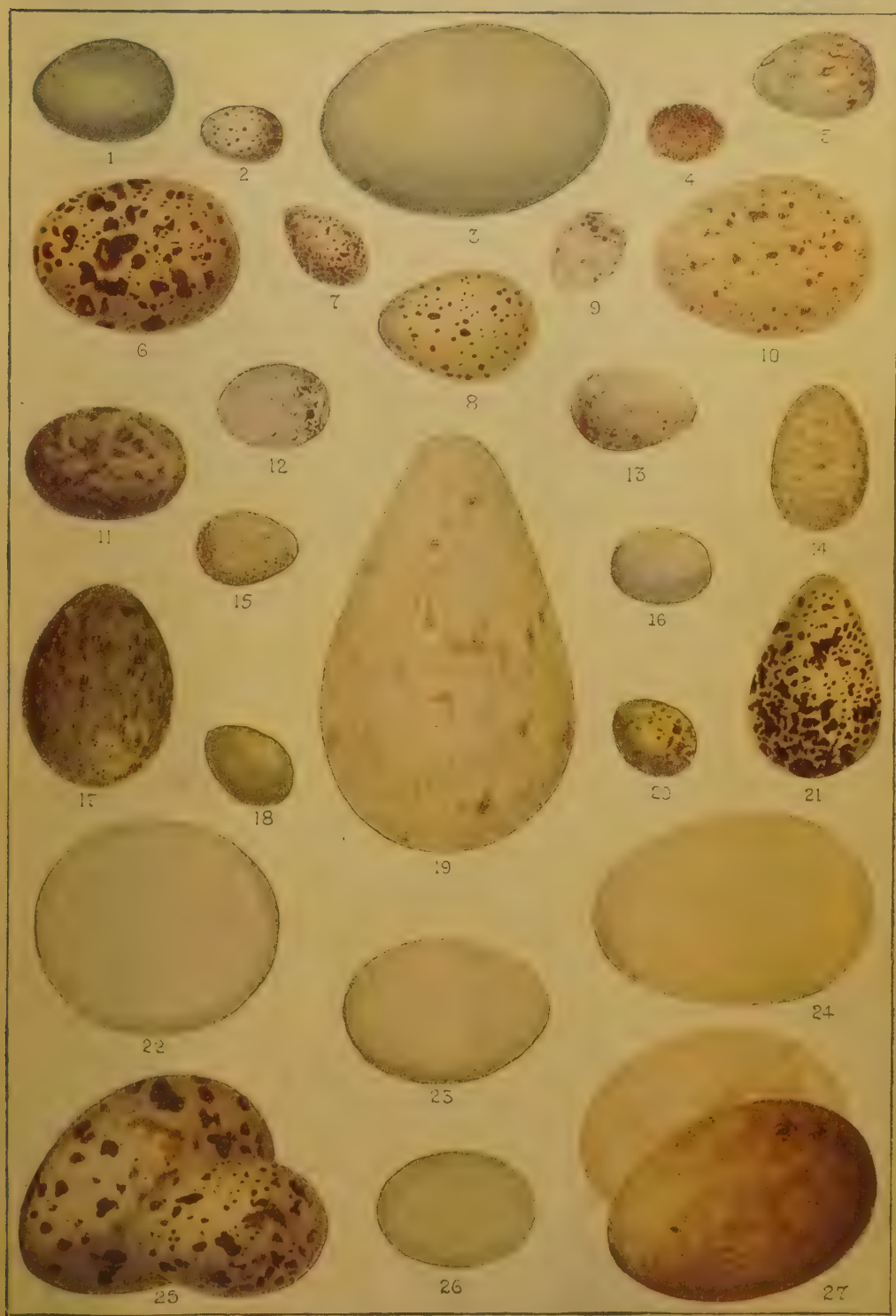
When young, the humming-bird might pass for a strange sort of swallow, for its beak is blunt and wide like that of the young swallow. But as it grows older the beak gets longer and slenderer until the full-grown bird has a bill ready to dip into the smallest flower to drink the honey which it stores. It does not depend wholly upon honey, though that is the chief part of its food. It eats a great many insects. In this respect it is a good friend to man. But it has another value: by going from flower to flower as it does it carries pollen from one to another, and does for those flowers what bees do for others, in making the plant fruitful.

There are nearly five hundred species of humming-birds, so it is hopeless for us to attempt any detailed description. The most remarkable part of their frame, after their splendid wings, is the long beak with its tongue capable of being shot out like that of the chameleon. The tongue acts like a pump, and the beak is wonderfully constructed to help.

The humming hermit-bird of the forest, & a giant eight inches long

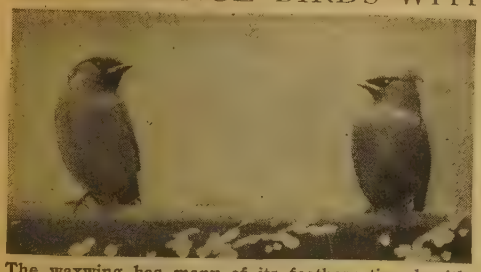
Among the most famous humming-birds is the Jamaican, which has two long feathers growing beyond its tail, far longer than the body of the bird. The hermit, with its long beak and long tail, haunts the dark forest, eating insects, instead of seeking honey in the sunshine. The sword-bill is the longest-beaked of all the humming-birds. Although the bird itself measures only four inches, the male bird has a beak four inches in length, while the female, still better provided, has a bill nearly twice the length of her body. The giant humming-bird is eight or more inches in length, and has wings measur-

CHARACTERISTIC EGGS OF AMERICAN BIRDS



1. Jays
2. Titmouses
3. Egrets and Herons
4. Wrens
5. Orioles and Blackbirds
6. Grouse or Partridges
7. Swallows
8. Woodcock
9. Pewee Flycatchers
10. Gallinules, Coots and Mudhens
11. Whip-poor-will; Night-hawks
12. Towhee finch
13. Pigeons
14. Brown Thrasher
15. Cowbird
16. Bluebird
17. Crows, Ravens, etc.
18. Thrush
19. Guillemots and Auks
20. Sparrows
21. Plovers
22. Owls
23. Grebes
24. Scaup-duck
25. Gulls and Terns
26. Cuckoos
27. Hawks and Falcons

STRANGE BIRDS WITH STRANGE FEATHERS



The waxwing has many of its feathers tipped with red like sealing-wax. Like many birds, the waxwing does not get its fine feathers till full grown.

The tropical manakin is brilliantly colored with a feather beard. It has a curious flight, and the beating of its wings sounds like a spinning-wheel.

This bell-bird has a wonderful note, like a silver bell. When many are calling, the sound of note following note is like the beating of many hammers on anvils.

The nightjar flies in the dark, swiftly and silently as a swallow. It is wrongly called the goat-sucker.

The quetzal is a Central American trogon. Its feathers keep their lovely colors even after the bird's death.

The umbrella-bird is the biggest of the chatterers, famous for its umbrella-like hood of gray feathers.

The cock-of-the-rock is also a chatterer, brilliant orange-red in color, and crested to the tip of the beak.

The banded cotinga is a Brazilian bird which lives among the tree-tops, only descending to feed.

The photographs on these pages are by Lewis Medland, W. P. Dando, Oliver Pike, R. B. Lodge, and others.

THE HANDSOMEST BIRDS IN THE WORLD

The satin bower-bird, a member of the crow family, is a great gardener and builder, and loves to make his home beautiful with flowers and gay feathers.

Java sparrows are often seen in our avairies. They have smart white feather collars in winter and spring. The Java sparrow is a type of the weaver-bird.

The gorget bird of paradise is most beautiful with its colors of black, purple, copper, green and gold.

The great bird of paradise is the biggest of its family, and has feathers like velvet as well as the wonderful spreading tail. The colors in its plumage are gorgeous.

The humming-bird, one of the loveliest of birds, flies so rapidly that its wings hum like those of a bee.

The twelve-wired bird of paradise has a tail unlike any other bird's. The shafts are bare like wires.

Hundreds of sociable weaver-birds build nests under one roof until the tree breaks under the weight.

SOME BEAUTY BIRDS OF OTHER LANDS

Hornbills live in Africa and India. Kaffirs in time of drought kill a hornbill as an offering for rain.

The toucan, which we see here, has an enormous bill, which is honeycombed with air-cells to lighten it.

The laughing jackass of Australia is, as we see here, really a kingfisher. It loves to mimic the human voice. It lives on fish or insects and reptiles.

Australia's beautiful lyre-bird is closely related to the pretty little wren, though it looks so different.

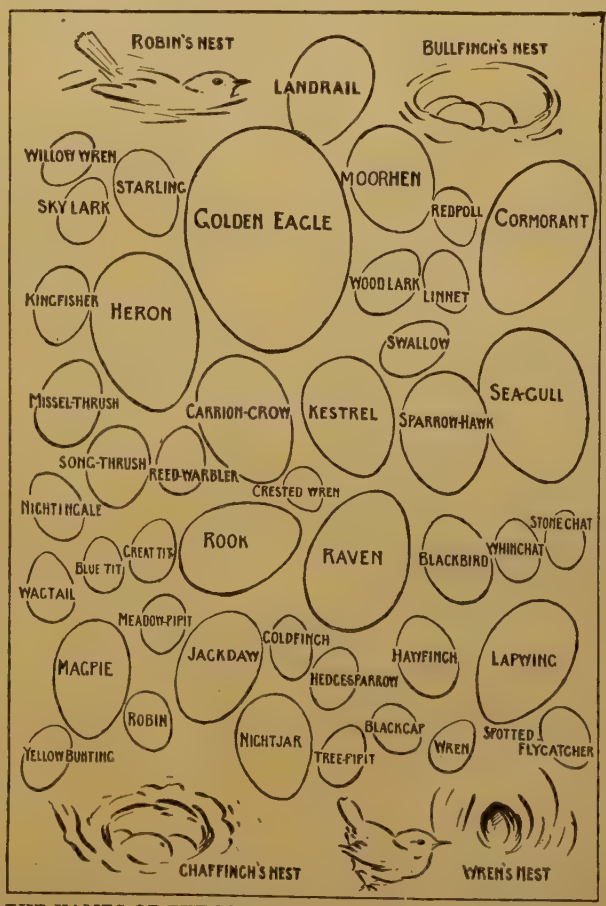
The kaka parrot is a member of the kea family, but harmless. The kea proper kills sheep for food.

The grey parrot of West Africa is a clever mimic. It can imitate birds and beasts, whistle a song, mock street criers, and copy the sound of machinery.

Love-birds belong to the parrot family, and though their home is in Africa, they thrive in our homes, where they make amusing little companions.

ing five or six inches across. It hovers over a flower like the smaller ones, but moves more slowly, and seems to gain support from its tail, which, while the bird is tapping a flower, opens and shuts like a fan.

Of course the beauties of the humming-bird are well known. The racket-tailed has two long feathers from the tail, and two, like those at the back of the six-plumed paradise bird's head, bare but glistening to the tip, where the feather-web grows out in the shape of a racket. Then there are humming-birds with gorgeous crests and ruffs, humming-birds with balls of white feathers round their legs like powder-puffs, humming-birds with "boots" of white feathers, spangled humming-birds, humming-birds with snow-capped heads, with long beaks, with short beaks, with upcurving beaks, and beaks bending downwards like the scimitar of an Indian prince. We can never say that we have exhausted the beauties of bird-land until we have seen these visions of splendor in their own homes. The sun-birds resemble them and are often called humming-birds, but they belong to a different order.



THE NAMES OF THE BIRDS' EGGS ON THE OPPOSITE PAGE.

We must turn back again for a moment to the crow family to make the acquaintance of the bower-birds. The males are a shining blue-black, except on the wings, where they are deep black. They are handsome, but they interest us chiefly from their love of beauty. They make their nest like ordinary birds, but they build avenues of twigs and houses or bowers to play in. Here the two sexes meet. The male birds show themselves off and the females are wooed and won by the best among them. But while the wooing is in progress the bower is a wonderful place. Sometimes it is several feet high, made of twigs and elaborately decorated. The gay feathers which other birds have dropped, pieces of colored cloth that they can pick up near men's homes, bleached bones, even bright tools, they take and build into the bower. It is said also that they bite off orchids and other beautiful flowers growing wild near them, and weave them into the decorations. The flowers fade, of course, but the dead ones are taken out each day and thrown behind the bower, while fresh flowers are put in their place. There are different sorts of bower-birds, but in all the habit of building bowers is the same. One of them, the Papuan bird, makes a hut, two feet high, at the foot of a tree, roofs it with moss, and builds a gallery round it.

This combining of several birds to build an assembly hall reminds us all of those remarkable birds, the weavers. They form a large family, some of them very beautiful, like the whydah

EGGS OF WELL-KNOWN ENGLISH BIRDS

The names of these eggs are given on another page.

bird. The sociable weavers are even more ingenious builders than the bower-birds. They collect vegetable fibres and weave them round the branch of a tree. This forms the thatch, or roof of the dwelling. Underneath they make a great number of nests, where as many as three hundred birds may have their homes, all under the same roof. There they dwell together in peace, each pair of birds having their own nest and rearing their little ones.

THE WEAVER-BIRDS AND THEIR NESTS, AND THE LITTLE JAVA SPARROWS

In the following year they make new nests. These they join on to the layers of nests made in the previous year. To do so they have to make the roof bigger, and in course of time, as layer after layer of nests is added, the huge structure looks like a thatched cottage. Finally it becomes so heavy that it breaks the bough of the tree upon which it is placed, and a fresh start on another branch or tree has to be made.

The Java sparrow, a favorite bird in our aviaries, which has grey wings, black head and tail, white cheeks and pink beak, is a type of weaver-bird. They are very sociable birds. In the house at which this story is written there is an aviary, where, among the birds, are two Java sparrows, and two doves. The Java sparrows have not built nests; they always go to bed with the doves. The doves roost high up on a ledge of cork at the top of the aviary. One Java sparrow, when evening comes on, always perches itself on the shoulders of one of the doves, while its mate takes its place on the ledge of the cork, under the breast and between the legs of the second dove. There is no quarreling about positions unless the doves are late in going to bed. Then the little birds chase their big bed-fellows about, hop on to their shoulders and begin to peck them gently, or pluck at their feathers, as if to say, "Come, come, it's past our bedtime."

THE LYRE-BIRD AND THE PEACOCK, THE BIRDS WITH BEAUTIFUL TAILS

The Java sparrows are not as gorgeous as their distant cousin, the whydah bird, but they are still handsome and very interesting. The white feathers on their cheeks disappear as summer advances, and the cheeks, neck and head are an unbroken black.

We have read already of some of the loveliest birds, like the pheasants. Now we come to another of the big beauties, the lyre-bird. It has a strikingly beautiful tail, shaped like the musical instrument called the lyre. Only the male bird has this, and not until he is four years old. The lyre-bird has a gift for imitating the songs and cries of other birds. In that he has a decided advantage over our most famous tailed domestic bird, the peacock.

Perhaps because it is a comparatively common bird in our zoos and in some parks and private gardens, we do not realize what a supremely beautiful bird the peacock is. No other bird has more perfectly colored plumage, but nevertheless the peacock is a disagreeable bird, with a hoarse screech for its call, which can be heard far and near. In India, of which country it is a native, the cries of these birds, when assembled in hundreds in the woods, become almost intolerable to one who dislikes discordant sounds.

THE STRANGE TOUCAN, AND THE HORNBILL WHICH BRINGS UP ITS YOUNG IN PRISON

It is well for him that he is such a beauty in appearance, or the peacock would never be tolerated in private life. When the courting season is over, his fine feathers disappear, and he slinks away until new ones grow. Then he comes out again in all his glory, proud as only a peacock knows how to be.

With all their splendor, some of the beauty birds, it must be admitted, are to be regarded as a little freakish, and some of them are not all that could be desired in their ways. Among the strange birds let us take first the handsome but queer toucan and the hornbill.

The toucan is a bird with a huge beak like a small pelican's, but not soft like that great fisherman's bag-net. It is notched like a saw, and as it is brightly colored it gives the bird a very strange appearance. This beak is not heavy, for it contains air-sacs which make it light. The hornbills share this advantage. They have big bills, with helmets of horn on the top, and these are made light in the same way.

The hornbills are famous for a curious fact. When the female has laid her eggs in a hollow tree, the male makes a prisoner of her by plastering up the entrance, leaving only a small slit through which he can pass food for her

CHARACTERISTIC NESTS OF AMERICAN BIRDS

1. Yellow Warbler (type of hempen nest in small tree). 2. Wild Cliff Swallow; Eaves Swallow (nests made of mud). 3. Typical Hawk's, Owl's or Crow's nest (in a forest tree). 4. Redstart's nest (showing a Cowbird's intruded egg). 5. Red-eyed Vireo (hammock-like suspended nest). 6. Nest and eggs of Bluejay. 7. Nest-hole of a Tree Swallow. 8. Nest-hole originally dug by a Woodpecker, now the home of a Wren. 9. Phoebe Flycatcher (on a beam in a stable). 10. Mourning Dove. 11. Fish Hawk; Osprey. 12. Grouse. 13. Grebe. 14. Tern.

and the young ones. She seems to assist in this. He does not let her and the family come out until the young ones are nearly full grown. The male bird, who has to find the food, is worn almost to a skeleton during this long time.

The king of the handsome climbers is undoubtedly the parrot. We cannot stay here to glance at the whole tribe, for, when we sort out the many forms of parrots, macaws, love-birds, and cockatoos, there are more than 500 species to deal with. The handsome little parrakeet which is so often seen in America has its home in Australia. The grey parrot is a native of West Africa. Macaws come mainly from the warm parts of South America and from India. When wild the birds all eat fruit and seeds. One species, however, the kea, has become a flesh-eating bird.

THE STRANGE STORY OF HOW THE KEA BIRD CAME TO EAT SHEEP

This is one of the few instances of a bird's nature changing while actually under the observation of man. Nobody knows for certain what has caused it to change, but the kea has become a deadly enemy of the sheep-farmer in New Zealand. Its food had always been insects and fruit. One day, in 1869, a kea was found standing on the body of a dead sheep, tearing away at the wool. Such a thing had never before been known to happen. Ever since then the kea has been a bird of prey. The change could not have come as suddenly as that; the attacks of the kea must have been made before, but it had never been observed. Now two or three keas attack a sheep together, and by means of their long, cruel beaks they kill it. Then they peck open its body to reach the rich fat inside.

What could have brought about such a change? Some scientists believe that this may be the explanation: There is a curious growth in New Zealand which looks so much like a mass of wool that it is called the vegetable sheep. The kea, by pecking away at this, was able to find grubs and insects which it liked. Then it attacked real sheep in mistake for the vegetable sheep, and pecked away to find its customary food until it reached food which it liked better. Since then it has remained a flesh-eater, and is the most deadly foe the sheep-farmer has.

THE LAUGHING BIRD THAT MOCKS A MAN IN THE AUSTRALIAN WILDS

While we are thinking of Australasian birds, we must not forget the laughing jackass. This is a bird which could beat the parrot, or even the famous Indian starling — called the myna — at laughing. Parrots and mynas, as we all know, marvelously imitate human speech. Although they are very wise birds they do not understand what they are saying. The mewing of a cat, which they imitate perfectly, has no more meaning for them than a song which they may learn to sing. So the laughter of the laughing jackass has no meaning for the bird. It has a voice, and uses it in this way. It follows a man in the wilds where there are trees, and perches near him, chuckling and laughing all the night and every time he shows himself in the open.

The laughing jackass is really a kingfisher, belonging to a tribe of birds which has many species. They live in nearly every country. Most of them eat fish, which they catch by darting into the water; others live on insects and reptiles, and even rob nests of young.

THE BEAUTIFUL KINGFISHER AND THE BIRD WITH A NOTE LIKE A BELL

The European kingfisher is a beautiful bird, which at one time was very scarce, owing to thoughtless women wearing its plumage in their hats. It flies like a swallow over the water, then, when it sees a fish, dives down like a flash. It can hang in the air like a kestrel, and can drop into the water with the swiftness of a gannet. The belted kingfisher belongs to North America but is rather rare. Some of the kingfishers are said to build their nests of the bones of fish which they have eaten. The nests are built at the end of long tunnels bored by the birds into the steep bank of a stream.

We find more strange beauties among the family of birds called chatterers. The most striking is the umbrella-bird. This has a fine crest upon its head, and though the sides of its neck are naked, it possesses a lovely lappet composed of loose feathers hanging from beneath the throat. When it desires to call its mate,

it raises its crest, moves its lappet in stately fashion, and pipes loudly. A more remarkable piping bird is known as the bell-bird. There are four species of this bird, of which the most famous is a pure glossy white. Its call is like the note, clear and melodious, of a beautiful bell. Sometimes it utters only one note, then rests. At other times it utters several notes, which then sound like a blacksmith playing on his anvil with a hammer. Both these birds are South American, dwelling in the dense, hot forests along the Amazon.

THE STRANGE SONG OF THE MANAKIN AND THE WAYS OF THE HOOPOE

In the same family are the manakins, marvelously-colored little birds; and the cotingas, nearly related to the bell-birds, but far more brilliant in plumage. The manakin has a strange little song, which he utters when courting. He dances, too, in the funniest way, as if trying to show how much more agile he is than his fellows. Two rivals meet on the bough of a tree, sing their song and leap into the air, each in turn, always rising to the same height and always descending upon the exact spot from which they rose. But if they discover that they are watched by enemies, they disappear. They also live in South America.

They have a rival in the hoopoe, a lovely European bird which would regularly make its home in England but for the guns of "sportsmen" who think it manly to shoot them. It is of a rich russet hue, with a beautiful crest upon the head and with wings marked out in black and white. Its mortal enemy is the hawk. The moment one approaches, the hoopoe lays itself flat on the ground, lowers its crest, and spreads out its wings, and what looks like a little heap of rags remains safe, unsuspected.

THE COCK-OF-THE-ROCK, THE BLACK-HEADED NUN, AND THE TINY TROGON

Returning to the chatterers, we must notice the brilliant Brazilian cock-of-the-rock, famous for the great crest which hides its nostrils, and the resplendent orange plumage, for the sake of which the unfortunate bird is mercilessly shot. The crest of the cock-of-the-rock brings to mind the bird which is in many respects like a cuckoo, the plantain-eater. But it is far handsomer than that bird, with its crest and gay plumage, and of far larger size. When perched at the top of the high trees in which it makes its home, it gambols and plays and mews like a cat. There is another bird, a little one, the black-headed nun, which mews, too, but like a tiny kitten. Another gaudy crested bird is the trogon, of which an American species, called the quetzal, is distinguished by a long tail. It is the national bird of Guatemala, and its portrait appears on Guatemalan postage-stamps.

All the birds considered in this story so far are day birds, but we have several which go out to work with the bats and owls, and all are dull in color, though sometimes wearing curious ornaments. One of these is the night hawk, often seen high in the air at sunset. Another is familiar to the ear if not to the eye, taking its name *whippoorwill* from its cry. A third is a big southern species called chuck-will's-widow. Each of these birds feeds on insects caught as it flies. It is a friend of the farmer, and a handsome one, with its beautiful mottled plumage.

BEAUTY BIRDS THAT DIE TO MAKE A WOMAN'S HAT

One member of this bird's family has enormously long streamers in its tail, while another has feathers which float far out behind the flying bird, the web of the feather growing from the tip halfway up, and leaving the upper half bare. The proper name of this bird is the nightjar.

The birds of which we have been reading help to make the world more lovely. The world would be a dull place without the wonderful color of birds and flowers, and we ought to hate everything that robs the world of its beauty and makes it in any way a less lovely place. A cruel fashion has for many years encouraged women to wear fine feathers that can only be had by destroying beautiful birds, often with great cruelty. But more and more these fashions are dying out, and gentlewomen are more and more refusing to wear a hat made beautiful by such cruel means. So that in the future the birds of beauty will, let us hope, have fewer enemies than they have had in the past, and will live and flourish and help to make the world a beautiful place to live in.

THE NEXT STORIES OF NATURE BEGIN ON PAGE 1823.

LETTY'S GLOBE

When Letty had scarce pass'd her third glad year,
And her young, artless words began to flow,
One day we gave the child a colour'd sphere
Of the wide earth, that she might mark and know,
By tint and outline, all its sea and land.
She patted all the world; old empires peep'd
Between her baby fingers; her soft hand
Was welcome at all frontiers. How she leap'd
And laugh'd, and prattled in her world-wide bliss:
But when we turn'd her sweet unlearned eye
On our own isle, she raised a joyous cry,
"Oh! yes, I see it, Letty's home is there!"
And while she hid all England with a kiss,
Bright over Europe fell her golden hair.

C. TENNYSON-TURNER.

HOW THE MAPS ARE MADE

CONTINUED FROM 1658

HAS it ever struck you as a wonderful fact how it comes about that a picture of the world, which is a round ball, can be drawn on a flat piece of paper? Try to make a piece of paper fit round a globe, and you will see how impossible it is.

It is impossible to make a perfectly true picture of the round earth on a flat piece of paper. And let us say at once that no map in the world, however beautifully it may be done, is really quite true. Every map is wrong—just a little wrong; but this small amount of error does not matter, *because it is known.* Error is only dangerous where it is unknown. Where it is known, we are aware of it, and make allowance for it. That is important to remember always.

In a map we can see exactly what is the shape of a country, and which are the oceans that sweep against its shores. But in such a picture as a map of America we should never see how the land lies between New York and Boston, and so we split up the earth into smaller pictures still. We make maps of France, maps of Germany, and maps of England. Here we can see the chief rivers of these countries, and their mountains or hills, and the names of their chief towns. But we are not yet satisfied, and so we split up the earth into smaller pictures. We make up maps of counties, or even of little districts and single towns, so that men may spread these pictures before them and know exactly what the places are like in every detail. You have often seen a traveler wandering through a city like Chicago with a map in his hand. It is wonderful to think that he, who is so small in the midst of even our streets, yet holds in his hand a picture of the whole great city.

But a child may hold in his hands a picture of the whole world. We have made our tiny little maps, bit by bit, and then we have added these together, and the whole picture makes up the picture of the earth, and a little child can hold it in its hands. If you will take into your hands a school-room globe, or a map of the two hemispheres, and think what these things really mean, it will help you to understand how interesting and also how wonderful map-making is.

For you hold in your hands, which are very small and weak, the picture of the vast earth, which has millions of men and women living upon it, millions of animals, millions of trees, and which consists of tremendous mountain ranges, enormous oceans, and vast continents of land. Man has been able, you see, to make so tiny a picture of the earth that a child can hold it, study it, and understand

it. Now, maps and globes are interesting things to study and look at and wonder about, but it is in the books written concerning these maps and globes that we really learn how interesting is the world on which we live.

This is a birdseye view of the part of London that lies around the Houses of Parliament. Even if we could take a picture of the whole of London from a balloon, it would be hard to find our way from it, so crowded is the great city.

And so we are going to read about all the interesting things man has discovered about the different lands which make up the earth. We shall then be able to look at a map and feel that we know what kind of climate a country has, what kinds of wild animals wander there, how the people earn food and clothes for themselves in that part of the world, and what trees and flowers and plants grow there; we shall come to know everything that is to be known about this wonderful earth on which we live.

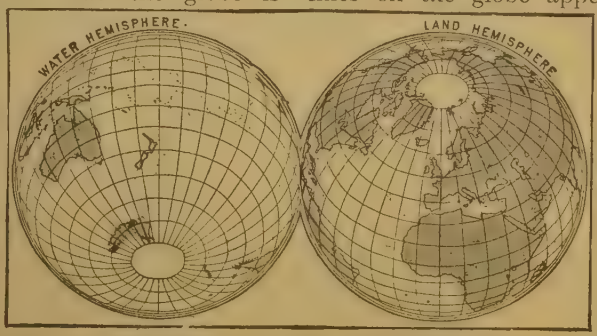
Now let us start and see how a picture of the earth can be made. Have you ever seen an artist copying another artist's picture? If he wishes to be quite accurate in his copy, he will draw a number of lines up and down the picture he is copying, and then lines across it, and then he will draw exactly the same lines on his canvas or piece of paper. When he has done this, he will be able to see precisely where the different details of the picture touch the lines, and so he will be able to make his own picture in that respect an exact copy of the other.

It is something like this in drawing a picture of the earth. Men make a round globe, and mark upon it where the North Pole should be and where the South Pole should be. After that they draw a number of lines from the North Pole to the South Pole downwards and across the globe. The lines that run downwards they call *meridians of longitude*, and the lines that run round the globe they call *parallels of latitude*. There are 360 meridians, or degrees, of longitude and the space between each at the Equator measures one degree, or 60 geographical miles. Every tenth meridian is usually shown on the globe. The parallels of latitude are drawn in a different way. A line is first drawn right round the globe in the centre; this is called the Equator. Then eight lines are drawn above the Equator, and eight below it, making seventeen in all. The degrees between each of

This is a map of the part of London shown above, with the streets made clear. It is quite easy for anyone holding plans like this to find the way. Though you would only appear as a dot on this plan, you can hold in your hand a map showing the whole of a city with the names of the streets and buildings on it.

these lines is also counted ten. The Equator line is marked nought, and the lines then go 10, 20, 30, 40, 50, 60, 70, 80, up to the North Pole, which is marked 90, and 10 to 80 in the same way down to the South Pole, which is also marked 90.

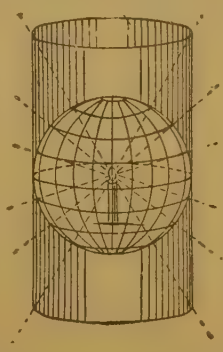
So now you see that the globe is lined and crossed all over, like a bird-cage, or like that copy-picture of which we spoke a moment ago. It is, therefore, easy enough to put in the different countries. All that we require is the report of sailors, who come back from sailing about the world with tales of new lands. They know exactly how the shape and points of these new lands touch and come away from the meridians of longitude and the parallels of latitude; and as soon as they tell us on which degrees of latitude and longitude such a place is situate, we can safely mark it in on our globe.



Here are two views of the globe, showing the land and the water. They are called hemispheres, which means half the globe. The lines running down are called meridians of longitude; those that run round are called degrees of latitude.

But what are we to do about maps? People cannot put a globe in their pockets when they go a journey, and, nice enough as globes are, they cannot be made big enough to give us all the details we want to know about the earth. So we have to try to reproduce on a flat piece of paper the picture of the earth that we have painted on the globe. Perhaps you have heard the name Mercator. "Mercator's Projection" is found in every good atlas. Mercator's real name was Gerhard Kramer; he was a German, and lived in the sixteenth century. To him, and an Englishman named Edward Wright, we owe the wonderful maps which are called "Mercator's Projection."

Let us see if we can understand Mercator's Projection. It is obtained by placing a cylinder of paper round a properly marked glass globe, and by means of a light getting the shadows of the meridians and parallels thrown upon the paper. These shadows are drawn, and when the scroll or cylinder of paper is stretched out, we find that the curved lines on the globe appear upon it in perfectly straight lines, up and down, and from side to side. Instead of troublesome curves, which would sadly trouble a mariner in shaping his vessel's course, we have on these maps straight, clean lines. It is true that these shadow lines are not quite accurate, and that on a Mercator's map certain countries appear larger than they really are. But the shape of these countries is quite accurate, and sailors need never make a mistake if they go by this wonderful map.



This picture shows the way the Mercator's projection map of the world is made. By placing a light inside a glass globe with the lines of latitude and longitude marked on it, shadows of the lines are thrown on a scroll of paper round the globe, and these lines are drawn on the paper.

We must not suppose that the end of map-making has come. Even if Mercator's Projection lasts for hundreds of years, the business of map-making will still go on. For our business now lies in *filling up the picture*. There are many parts of the earth about which we know scarcely anything. Towns may exist of which no man at present knows the name. Hidden deep in the midst of enormous continents, there may be living at the present moment races of men and women of whom we know nothing—people who never heard of the balloon, the telephone, the motor-car, or the railway engine.

And so it is that the map-maker sits at home waiting for the explorer to return with wonder-tales of towns and lakes and mountains, ready to add another touch to his picture of the earth.

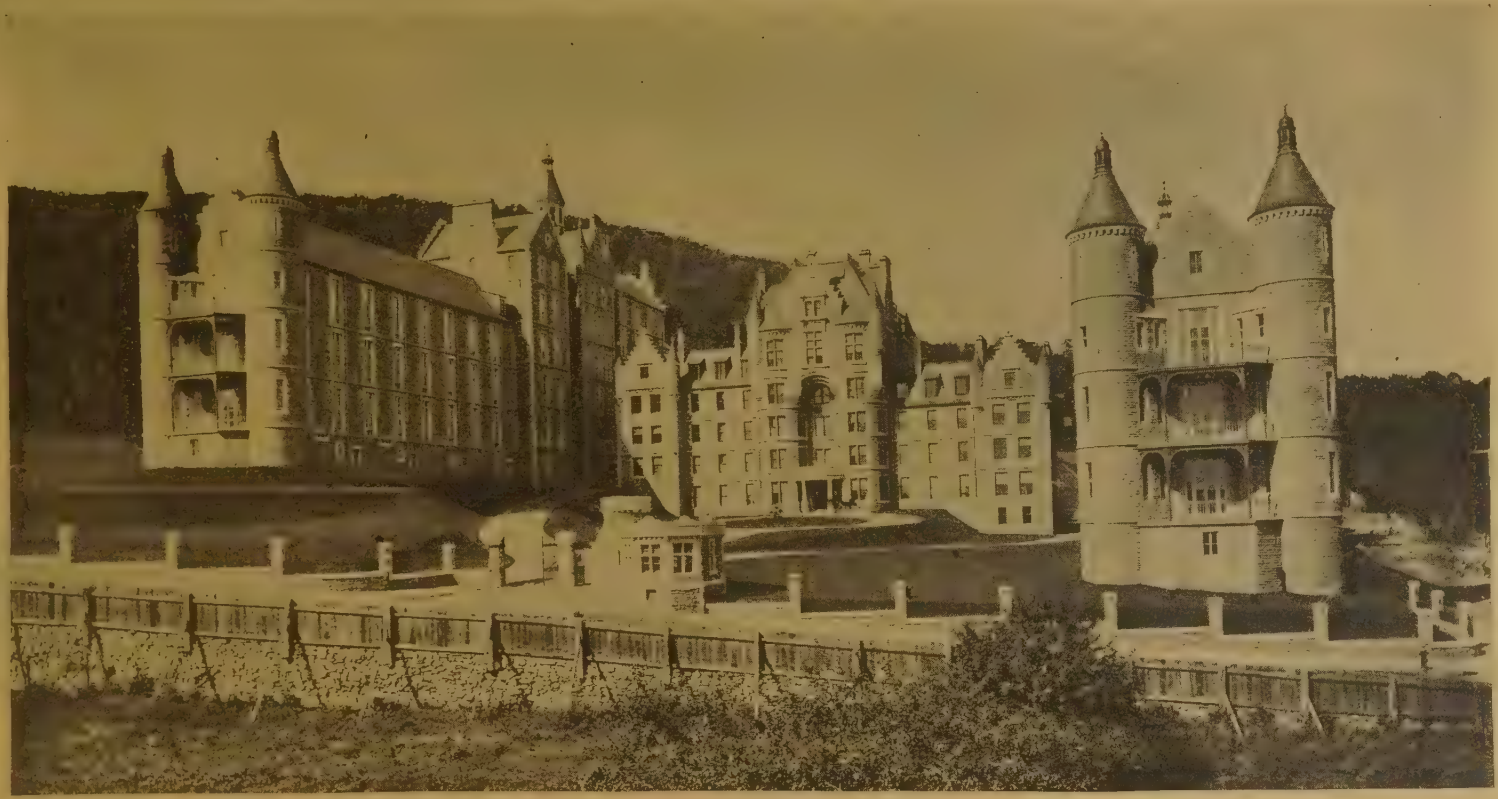
THE NEXT FAMILIAR THINGS BEGIN ON PAGE 1997

A GENERAL VIEW OF McGILL UNIVERSITY, MONTREAL

Photograph by Notman, Montreal.

The large number of well-equipped colleges and universities shows the Canadian attitude toward education. Among her universities, none surpasses McGill, a general view of which you see above. The bequest of the original founder, James McGill, has been followed by many magnificent gifts, which have enabled the faculties to develop an institution which is now known over the whole world. Several separate colleges are affiliated with the university, and its advantages are also open to women. As you may see from this picture, the university is beautifully situated. The long avenue lined with college buildings has a particularly fine effect.

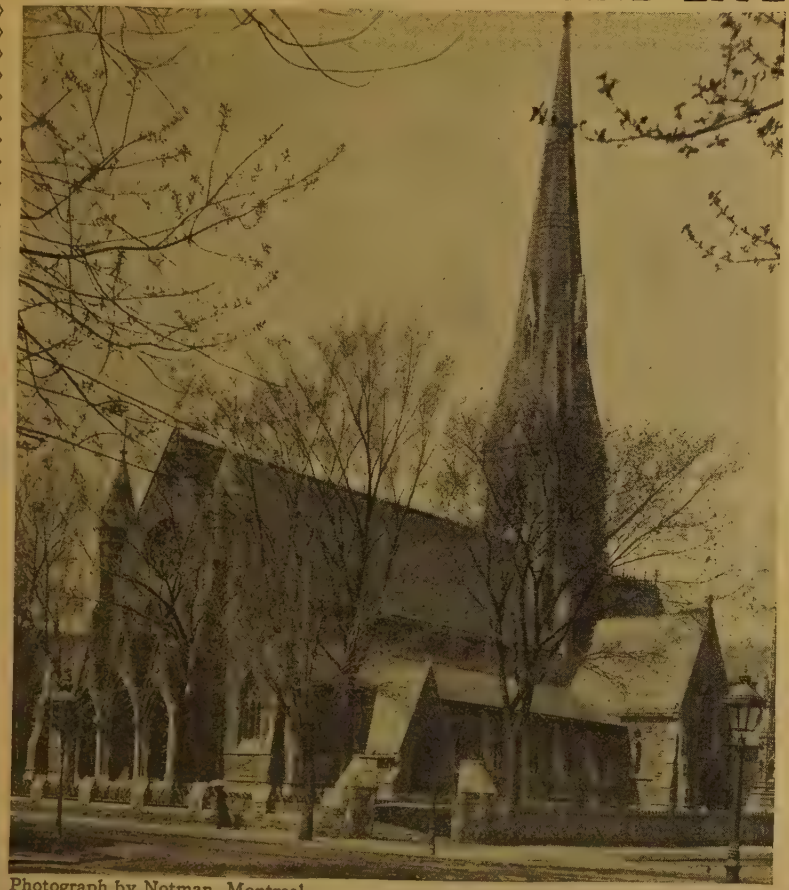
THE ROYAL VICTORIA HOSPITAL IN MONTREAL



Photograph by Notman, Montreal.

The Royal Victoria Hospital in Montreal is one of the best equipped institutions in America. It stands on the slope of Mount Royal, almost directly behind the grounds of McGill University, and is a monument to the wise generosity of Lord Mount Stephen and Lord Strathcona, of whose successful careers you may read in another volume. Many Canadian girls have taken up the profession of nursing and have been very successful. The medical schools of Canada have a world-wide reputation for excellence, and a part of this is due to the fine opportunities for training and observation given to them by the great hospitals of the Dominion.

TWO IMPORTANT AND EFFECTIVE CANADIAN BUILDINGS



Photograph by Notman, Montreal.

From any elevated point in Montreal the frequency of church spires impresses every visitor. This is Christchurch Cathedral, the centre for the Anglican Church, in and around Montreal. It stands on St. Catherine Street, between University Street and Union Avenue. The cathedral was erected in 1859, and is effective and pleasing.

Photograph by Pringle and Booth, Toronto.

Few cities with twice the population of Toronto can boast a municipal building so extensive and so imposing. The City Hall shown above was completed in 1899 at a cost of about $5,000,000. The central tower is 300 feet high, and affords an excellent view of the city. The building stands on Queen Street, not far from Osgoode Hall.

THE GRANDEUR OF NATURE, EAST AND WEST

Photograph by Notman, Montreal.

The Saguenay River is a deep cleft between rocks rising high above the water, which is generally hundreds of feet deep. About thirty-three miles from Tadoussac, where it joins the St. Lawrence, Trinity Cape or Trinity Rock rises 1,500 feet in three great steps—much higher than the picture shows. Cape Eternity is across the river.

Photograph by courtesy of the Canadian Pacific Railway.

The Selkirk Range contains some of the most wonderful mountain scenery in the world, and no part of it is more fascinating than the Illecillewaet Valley, where the railroad follows the river valley, often crossing the stream, while the snow-covered mountains tower above. You can see the railroad bridge in the foreground.

THE SAD AND BEAUTIFUL EFFIE DEANS

This painting by Sir John Millais shows the young and beautiful but unhappy Scotswoman, Effie Deans, and her sweetheart, George Staunton, whose wife she became. Poor Effie was fated to undergo a terrible trial, as an old sweetheart of Staunton's, out of jealousy, stole their child, and Effie was accused of its death. Her sister Jeanie walked from Edinburgh to London, and pleaded with the queen to have Effie pardoned for a crime of which the poor woman was later proved innocent. This story is told in "The Heart of Midlothian."

THE WAVERLEY NOVELS

THE last two of Scott's novels which we are to read here are "The Heart of Midlothian" and "Old Mortality." The former is one of his great stories, and the heroine, Jeanie Deans, is one of the finest characters in fiction. She is drawn from real life. "Old Mortality" was the name given to an old man who used to wander about the graveyards in Scotland, keeping clean the inscriptions on the tombstones of the Covenanters, thus showing his love for those who had fought the good fight for religious liberty. The story named after him tells of the ruthless attempt made by the Governments of Charles II. and James II. to force episcopacy, or the government of the Church by bishops, upon the people of Scotland, who hated that form of religious control. The Covenanters were people pledged to a covenant or sacred bond, which bound them to stand together in opposition to the projects of the king in 1638, and to oppose Papacy and preserve the Reformed Church of Scotland.

A WOMAN'S HEROISM

BEING THE STORY OF "THE HEART OF MIDLOTHIAN"

CONTINUED FROM 1670

MARGARET MURDOCKSON was the wife of a favorite servant of a clergyman named Staunton, rector of Willingham. She had a daughter; Mr. Staunton had a son. The daughter was a beautiful but very unsettled girl; the rector's son was equally foolish, and his father sent him abroad.

George, as the young man was named, resolved never to see his father again. He led a life of wild adventure. Arriving in Scotland, he became acquainted with one Wilson, a smuggler. He also became acquainted with Effie Deans, the daughter of a Scottish peasant. He planned to run away to some retreat with Effie Deans.

About this time a friend tried to bring about friendliness between father and son. The father sent his son a large sum of money, but wrote disowning him for ever. Stung by this letter, George Staunton joined Wilson in a perilous smuggling adventure. The two men were captured and condemned. By the self-sacrifice of Wilson, however, Staunton escaped.

Meanwhile, Effie Deans was arrested and condemned for causing the death of their little child. As a matter of fact, the infant had been stolen away by Madge Wildfire, the daughter of Margaret Murdockson. Convinced of her half-sister's innocence, Jeanie Deans, who, because of Effie's trouble, kept her own lover, Reuben Butler, a Presbyterian minister, at a distance, decided to walk to London to petition the king (George II.) for a pardon. Jeanie, when she arrived in London, was fortunate enough to enlist the sympathy of the Duke of Argyll, and by this nobleman's influence was enabled to see the queen. The description of this interview, which took place in one of the Royal gardens at Richmond, is one of the finest passages in the whole book.

The duke explained the singular law under which Effie Deans had received sentence of death, and detailed the affectionate exertions which Jeanie had made on behalf of her sister, for whose sake she was willing to sacrifice all but truth and conscience.

Queen Caroline listened with attention. She was rather fond, it must be remembered, of an argument, and soon found matter in what the duke told her for raising objections to his request.

"It appears to me, my lord," she replied, "that this is a severe law. But still, it is adopted upon good grounds, I am bound to suppose, as the law of the country, and the girl has been convicted under it. The

very presumptions which the law construes into a positive proof of guilt exist in her case; and all that your Grace has said concerning the possibility of her innocence may be a very good argument for annulling the Act of Parliament, but cannot, while it stands good, be admitted in favor of any individual convicted upon the statute."

The duke saw and avoided the snare, for he was conscious that, by replying to the argument, he must have been inevitably led to a discussion, in the course of which the queen was likely to be hardened in her own opinion, until she became obliged, out of mere respect to consistency, to let the criminal suffer.

How Jeanie Deans Pleaded for Her Sister Before Queen Caroline

"If your Majesty," he said, "would condescend to hear my poor countrywoman herself, perhaps she may find an advocate in your own heart, more able than I am, to combat the doubts suggested by your understanding."

The queen seemed to consent, and the duke made a signal for Jeanie to advance from the spot where she had hitherto remained. Her Majesty could not help smiling at the awe-struck manner in which the quiet, demure figure of the little Scotswoman advanced towards her, and yet more at the first sound of her broad Northern accent.

But Jeanie had a voice low and sweetly toned, an admirable thing in woman, and besought "her leddyship to have pity on a poor misguided young creature," in tones so affecting that, like the notes of some of her native songs, provincial vulgarity was lost in pathos.

"Stand up, young woman," said the queen but in a kind tone. And, after a few questions as to the Scottish laws, her Majesty asked how Jeanie had traveled up from Scotland.

Jeanie Describes Her Long Walk From Edinburgh to London

"Upon my foot mostly, madam," was the reply.

"What, all that immense way on foot? How far can you walk in a day?"

"Five-and-twenty miles and a bittock."

"And a what?" said the queen, looking towards the Duke of Argyll.

"And about five miles more," replied the duke.

"And I thought I was a good walker," said the queen; "but this shames me."

"May your leddyship never hae sae weary a heart that ye canna be sensible of the weariness of the limbs," said Jeanie.

"That came better off," thought the duke. "It's the first thing she has said to the purpose."

Poor Jeanie, it should be explained, had uttered certain remarks that could have borne a special and, for her, a dangerous meaning, in her replies to the queen's inquiries; and it had been arranged that when she trod on dangerous ground the duke should raise his hand to his chin.

"And I didna just a'thegither walk the hail way neither, for I had whiles the cast of a cart; and I had the cast of a horse from Ferrybridge and divers other easements," said Jeanie, cutting short her story, for she observed the duke made the sign he had fixed upon.

"With all these accommodations," answered the queen, "you must have had a very fatiguing journey, and, I fear, to little purpose; since, if the king were to pardon your sister, in all probability it would do her little good, for I suppose your people of Edinburgh would hang her out of spite?"

How Jeanie Deans Proved a Match for the Queen in Cautious Speech

This reference was to the Porteous Riots, with a description of which the story opens. Captain Porteous commanded the guard at the execution of Wilson, the smuggler, and, fearing a rescue after the escape of Staunton, ordered his men to fire on the mob. Seventeen persons were killed or wounded. About two months later—on June 22nd, 1736—Porteous was found guilty of murder. The king being then in Hanover, the queen granted Porteous a reprieve. At night the mob broke open the prison, the old Tolbooth or "Heart of Midlothian," as it was called, took out the officer, and hanged him to a post in the Grassmarket.

"She will sink herself now outright," thought the duke. But he was wrong.

"She was confident," she said, "that baith town and country wad rejoice to see his Majesty taking compassion on a poor unfriended creature."

"Hark, you young woman, had you any friends engaged in the Porteous mob?"

"No, madam," answered Jeanie, happy that the question was so framed that she could, with a good conscience, answer it in the negative.

"But I suppose," continued the queen, "if you were possessed of such a secret, you would hold it a matter of conscience and keep it to yourself?"

"I would pray to be directed and guided what was the line of duty, madam," answered Jeanie.

"Yes; and take that which suited your own inclinations," was the reply.

ONE WORD FROM THE KING'S MOUTH AND HOW MUCH IT MIGHT DO

"If it like you, madam," said Jeanie, "I would hae gaen to the end of the earth to save the life of John Porteous, or any other unhappy man in his condition; but I might lawfully doubt how far I am called upon to be the avenger of his blood, though it may become the civil magistrate to do so. He is dead and gane to his place, and they that have slain him must answer for their ain act. But my sister, my puir sister, Effie, still lives, though her days and hours are numbered!

"She still lives, and a word of the king's mouth might restore her to a broken-hearted old man, that never in his daily and nightly exercize forgot to pray that his Majesty might be blessed with a long and prosperous reign, and that his throne and the throne of his posterity might be established in righteousness.

"Oh, madam, if ever ye kend what it was to sorrow for, and with, a sinning and a suffering creature, whose mind is so tossed that she can be neither ca'd fit to live or die, have some compassion on our misery! Save an honest house from dishonor, and an unhappy girl from a dreadful death!

THE POWER AND PATHOS OF AN HONEST WOMAN'S SIMPLE WORDS

"Alas! It is not when we sleep soft and wake merrily ourselves that we think on other people's sufferings. Our hearts are waxed light within us then, and we are for righting our ain wrangs and fighting our ain battles. But when the hour of trouble comes to the mind or to the body—and seldom may it visit your leddyship—and when the hour of death comes, that comes to high and low—lang and late may it be yours! Oh, my leddy, then it isna what we have dune for oursel's, but what we hae dune for others, that we think on maist pleasantly. And the thought that ye hae intervened to spare the puir thing's life will be sweeter in that hour, come when it may, than if a word of your mouth could hang the hail Porteous mob at the tail of a tow."

Tear followed tear down Jeanie's cheeks as, her features glowing and quivering with emotion, she pleaded her sister's cause with a pathos which was at once simple and solemn.

"This is eloquence," said her Majesty to the Duke of Argyll. "Young woman," she continued, addressing herself to Jeanie, "*I* cannot grant a pardon to your sister; but you shall not want any warm intercession with his Majesty. Take this housewife case," she continued, putting a small embroidered needle-case into Jeanie's hands; "do not open it now, but at your lesiure—you will find something in it which will remind you that you have had an interview with Queen Caroline."

QUEEN CAROLINE'S GIFT TO JEANIE AND HOW SHE KEPT HER PROMISE

Thus ended the interview. Inside the needle-case was the usual assortment of silk and needles, with scissors, tweezers, etc., and in the pocket was a bank-bill for fifty pounds ($250).

Jeanie was delighted with the case, especially as it bore the queen's name, but was with difficulty persuaded by the duke to retain the bank-note, as that seemed so very large a sum of money to the poor Scotswoman.

Queen Caroline kept her promise, and Effie Deans was pardoned. Staunton succeeded to his family title with Effie as his wife. Soon afterwards, however, he was shot by a gipsy boy, who turned out to be his own son, who had been carried away by Madge Wildfire, and for whose supposed murder Effie had almost suffered death. So that in the death of Staunton there was a tragic retribution.

Effie retired to a convent, and Jeanie married Reuben Butler, the minister who had been her faithful friend throughout her troubles.

"Happy in each other, in the prosperity of their family, and the love and honor of all who knew them, this simple pair lived beloved, and died lamented," are the last words of the author on the devoted Jeanie and her husband, Reuben.

IN THE DAYS OF THE COVENANTERS

BEING THE STORY OF "OLD MORTALITY"

THE story begins on the morning of May 5th, 1679, when the annual "Wapinschaw," or weapon-show, was being held in the upper ward of Clydesdale. This festival, which the authorities favored because it attracted young men to military exercizes and sports, was regarded by the Presbyterians with disfavor. At the festival each Crown vassal was required to appear with such muster of men and armor as he was bound to make by his "fief" — which meant a piece of land held on condition of military service.

THE THREE YOUNG MEN WHO WERE SHOOTING AT THE POPINJAY

One of the sports was that of shooting at the popinjay. In this three young men greatly distinguished themselves. They were Lord Evandale, a suitor of Edith Bellenden, granddaughter of Lady Margaret Bellenden, of the Tower of Tillietudlem; Henry Morton, son of a deceased Presbyterian colonel; and a young man of humble rank, who kept his face muffled in his cloak. The issue was between Lord Evandale and Henry Morton, and the latter won, to the dissatisfaction, among others, of Lady Margaret, whose husband had fallen in one of the battles in which Colonel Morton, of Milnwood, had taken part before he joined the Royalists.

Among the merry-makers at the Wapinschaw were a sergeant and a private of Claverhouse's Life Guards, Bothwell and Halliwell by name. It suited the humor of Bothwell to test the loyalty of a stranger who was among them. Dissatisfied by the stranger's manner of drinking the toast put to him, Bothwell was proceeding to stronger measures, when Morton intervened on the stranger's behalf.

THE STRANGER AT THE SPORTS AND HIS CHALLENGE TO SERGEANT BOTHWELL

The man, however, stepped forward, and, saying that this was his quarrel, asked the sergeant if he would wrestle a fall with him. Bothwell gallantly responded, but at the third close was so violently thrown that he lay for an instant stunned and senseless. The two then shook hands, and the stranger, whose name was John Balfour of Burley, having secured Morton's companionship in his journey, mounted his horse and rode off.

Shortly afterwards a cornet brought news that the Archbishop of St. Andrews, whose health Bothwell had given to Burley, had been murdered. When Bothwell heard this he recalled the fact that when Burley had responded to the toast given to him he had used these words: "The Archbishop of St. Andrews, and the place he now worthily holds; may each prelate in Scotland soon be as the Right Reverend James Sharp" — who was assassinated. Bothwell now understood the reference, and quickly identified his late opponent with the commander of a band of zealous Covenanters.

On their way to Milnwood, where Morton lived with a miserly uncle, he learned from Burley that his companion had once saved his father's life in the battle of Longmarston Moor. This news strongly affected his attitude towards Burley's attempts to influence him in favor of the Covenanters or Presbyterian party.

HOW THE STRANGER WAS PURSUED AND ESCAPED FROM THE TROOPERS

Burley pursued his advantage when they heard from an old dame that the path which Burley had decided to take on bidding Morton farewell had been occupied by troopers. Morton, who knew nothing of the fate of the Archbishop of St. Andrews, was induced secretly to give Burley shelter for the night in his uncle's house, or rather in the hay-loft of a stable adjacent to the dwelling.

Very soon afterwards Morton was alarmed at the halting of a body of cavalry on the high road which wound round the foot of the bank on which the house of Milnwood was placed. The officer was on the point of ordering the house to be searched, when one of his party was heard to say:

"I cannot think it at all necessary. Milnwood is an infirm old man, who never meddles with politics, and loves his money-bags and bonds better than anything else in the world. His nephew, I hear, was at the Wapinschaw to-day,

and gained the popinjay, which does not look like a fanatic. I should think they are all gone to bed long since, and an alarm at this time of night might kill the poor old man."

So the cavalry passed on, and Morton, without exciting the alarm of the domestic Mrs. Alison, who had been staying up for him, was able to take refreshments to the fugitive. The two parted in the morning. Despite all that Burley could say, and greatly to his mortification, Morton's answer to all his inducements to "gird on his sword in the dear and precious cause" of the Covenant was that he was determined, "at least, as far and as long as possible, to unite the duties of a good Christian with those of a peaceful subject."

When Burley had ridden away, Morton had a somewhat stormy interview with his uncle, to whom he expressed a wish to leave the country and serve abroad, as his father had done before him. Morton, it should be observed, was driven to this wish by his apparently hopeless love for Miss Bellenden and his uncle's miserliness.

After the Wapinschaw, Lady Margaret Bellenden dismissed from her service an old woman named Mause Headrigg and her son Cuddie, because of the absence of the latter from the festival. They were recommended to Morton by Miss Edith Bellenden, and Cuddie—who, as a matter of fact, was the third competitor in the final shoot for the popinjay—entered Morton's service. But Mause had come under the influence of the Covenanters, and when Morton confessed to Bothwell that he had given shelter to Burley, Mause delivered such a speech against the episcopal party that there was nothing for her and her son to do but resume their travels. As for Morton, he was taken prisoner and carried to the Tower of Tillietudlem. Bothwell, being disposed to be friendly, allowed his prisoner to be muffled up in one of the soldier's

A RELIGIOUS SERVICE OF THE COVENANTERS ON THE LONELY MOOR

The story of "Old Mortality" describes the persecution of the Covenanters of Scotland in the time of Charles II. and James II., when men and women who refused to be forced by the Government into the system of religious worship approved by the State were hunted on the moors and in the glens of Scotland by the soldiers of the king. The Covenanters fought and bled for their faith and the liberty to worship God in their own simple way. For years they could not meet in their old churches, but gathered for worship, as we see them here, on the lonely moors, with scouts posted on the look-out for the troops.

cloaks, and consented for the time being to keep from mentioning his name.

When the party had arrived at the tower, they were given permission to rest there till the arrival on the morrow of Claverhouse, and provision was made for the safe custody of the prisoner. Miss Edith had a servant named Jenny Dennison, and both were much concerned to know the name of the prisoner. Jennie had many suitors, one of whom was a trooper named Tam Halliday.

THE HERO HAS TO FACE THE DREADED PERSECUTOR OF THE COVENANTERS

It was from Tam that she found out Morton's identity and it was by the assistance of Tam that she was enabled to secure her mistress, muffled in a plaid, and described as her kinswoman, an interview with the prisoner. On learning the reason of Morton's captivity, and that he would be brought before Claverhouse whose intimate friend and early patron the murdered archbishop had been, Miss Bellenden bade her maid find a messenger to take a missive to Major Bellenden her uncle, who, she thought, could help Morton out of the trouble into which he had unwittingly fallen. The major was Morton's friend, and arrived at the tower shortly before the man in whose hands the fate of young Morton would lie.

On the arrival of Claverhouse, it was made known that Lord Evandale had been despatched to disperse a conventicle, or gathering, of the Covenanters, who had become especially bold. And just after Major Bellenden had appealed without success to Claverhouse on Morton's behalf, Evandale arrived with the news that a large body of Covenanters were in arms among the hills, and had broken out into actual rebellion.

MORTON IS CONDEMNED TO DEATH, BUT HAS FRIENDS IN HIS HOUR OF NEED

When Sergeant Bothwell went to Morton to take him before Claverhouse he acquainted him with the news that Miss Bellenden had sought young Lord Evandale's help on his behalf; and this caused him to arrive at the conclusion, not for the first time, that his own suit had little chance of success, apart from his present predicament.

After a heated interview, Morton, who questioned the soldier's right to arrest him without a warrant, was condemned to death by Claverhouse, who refused to listen to the appeals of the major, although these were seconded by Lady Margaret. It was only on Lord Evandale's intervention that Claverhouse relented. And in giving way so far as to rescind the death sentence, the colonel, as he then was, warned his young friend against letting his private feelings stand in the way of his duty, adding that, from Morton's manner, it was certain that, if he should ever come to head an army of rebels, Evandale would have much to answer for. Whilst Evandale was distressed at the obvious concern for Morton's safety shown by Miss Bellenden, Morton, who had misunderstood some words he had heard fall from the young lady's lips, was mortified at the thought of being indebted for his life to his rival.

When Claverhouse set forth in pursuit of the Covenanters, Morton and three companions in captivity traveled in the custody of a small body of soldiers, who formed the rearguard to the column under the command of Claverhouse, and were immediately under the charge of Sergeant Bothwell.

THE INJUSTICE THAT MADE A LOYAL SUBJECT AN ENEMY OF THE KING

Morton's companions were Cuddie and Mause Headrigg and a zealous preacher named Gabriel Kettledrummle. The arrest of Cuddie on account of his mother's opinions added to Morton's sense of what he now regarded as the infamous and intolerable oppression of his countrymen in a free land.

Claverhouse's column was attacked by an overpowering number of the enemy, who were posted on Loudon Hill. On Evandale's suggestion it was decided, against the commander's own inclination, to parley with the rebels. Evandale wished to be the envoy, but Claverhouse willed it that his nephew and heir, Cornet Grahame, the youngest and hottest of his officers, should take a flag of truce and a trumpeter, and ride down to the edge of the morass dividing the two forces, and summon the rebels to lay down their arms and disperse.

In the parley Cornet Grahame was shot by Burley, who was in command of the Covenanters. The troops were scattered; Bothwell, taken at a disadvantage in a single combat with Burley was killed; and Lord Evandale

only just managed, with the help of a remnant of troopers, to save Claverhouse who had been surrounded after a desperate charge in which he had unhorsed Burley.

At a moment when Claverhouse and Evandale were in full flight, a bullet killed the horse which Evandale was riding, and the young man, himself wounded, was about to be struck down by Burley, when Morton, who with his fellow captives, was near at hand, intervened. Whilst Burley took up the pursuit of the flying soldiers, Morton aided Evandale to make his escape, thus repaying his indebtedness to Evandale earlier in that eventful day.

Meanwhile Major Bellenden took active measures for the defence of Tillietudlem (supposed to be Craignethan Castle), which was shortly afterwards reached by Claverhouse, who, before pursuing his journey, left some men to assist in defending the tower, pending his return to relieve the garrison.

HENRY MORTON JOINS THE COVENANTERS AND BECOMES A CAPTAIN

When Claverhouse had departed Evandale rode up in an all but exhausted condition. Then came the news that young Henry Morton was "out with the rebels."

The truth was that Burley had won the young man over. Morton was appointed a captain in the insurgent forces. At the same time he was repelled by the madness of the leaders and appalled at the lack of union in their councils. The news caused Miss Bellenden the deepest distress. This distress was increased when Lord Evandale, in a sortie, the object of which was to get provisions, was made a prisoner by Burley, who threatened to hang him the next morning if the castle were not surrendered.

Morton once again succeeded in saving Evandale's life, giving him his liberty on parole on the understanding that he would act as a mediator with the authorities for the redress of certain grievances which, in Morton's opinion, justified the taking up of arms; and, further, that he induced the garrison of Tillietudlem to surrender on a safe conduct being given to the ladies, the major, and their followers.

On the occupation of Tillietudlem it was decided that Morton should go to the camp of the Duke of Monmouth, in order to discover upon what terms the insurgents would be permitted to treat with him, the duke being in supreme command of the king's forces. The duke agreed to suspend hostilities for one hour to give the rebels an opportunity to lay down their arms, an act which he said must be the first step to negotiations for peace.

THE DEFEAT OF THE COVENANTERS AND THE PARDON OF HENRY MORTON

Battle ensued, in which the Covenanters were hopelessly routed, partly through the division in their ranks caused by the fanaticism of their leaders. Morton and Cuddie in their flight came upon a lonely farmhouse. Here a number of the most zealous of the Covenanters, with Macbriar and Mucklewrath, two of the ministers who would not listen to Morton's counsel on behalf of peace, were gathered. Morton was made their prisoner, but Cuddie escaped.

For a second time Morton was condemned to death. This time he was rescued by Claverhouse, but became a prisoner of war. His rescue was due to the fact that Cuddie Headrigg had fallen in with Claverhouse's party. Haled before the Privy Council in Edinburgh, Morton consented to go abroad pending his Majesty's pleasure, Claverhouse and Evandale entering themselves as securities for him. Then came the fall of the Stuarts.

THE HERO'S RETURN FROM EXILE AND THE HAPPINESS THAT AWAITED HIM

On his return from Holland believing that Miss Bellenden was engaged to marry Lord Evandale, Morton sought out Burley with the object of obtaining from him a certain document that would restore to her the Castle of Tillietudlem, of which a kinsman, Basil Olifant, had obtained possession. He was unsuccessful. Olifant, aware of Evandale's devotion to the now exiled Stuarts, sought to secure his arrest, and, as resistance was offered, ordered his party to fire. Evandale fell, mortally wounded, but a shot also brought down Olifant, whose death was the means of restoring Tillietudlem to the Bellendens. Morton, who arrived too late on the scene to save Evandale, was some months later married to Edith Bellenden. As to Burley, he died fighting, as did Claverhouse before him.

THE NEXT STORY OF FAMOUS BOOKS IS ON 2025.

This extraordinary figure, looking like the hideous objects some motorists make themselves, is a native "doctor" in South Africa.

Much of the hardest work in South Africa is done by the Kaffirs. This is how the Kaffir workers in the mines live together, in a small town or "compound," as it is called. These little white huts are much more healthy than the mud buildings seen in the picture on page 1783.

The Boers, or Dutch farmers, were the great colonizers of South Africa. Having bought a large wagon and teams of oxen, the Boer farmer would set forth with his family across the veldt, a great grassy stretch of country without trees, until he came to a fertile district in which to settle and make his farm.

Here are some merry Kaffirs at play after their day's work in a gold-mine. The two men in the foreground are dancing, having decked themselves with some odd European garments.

This Basuto chief has his heart's desire; he has a British uniform and a top hat, a garb different from that worn by his soldier.

These photographs are by Messrs. H. W. Nicholls, N. P. Edwards and Messrs. Valentine.

PEOPLE OF NATAL

THE BRITISH EMPIRE IN AFRICA

CONTINUED FROM 1720

WHEN you look at the map of the world you will generally find that those parts of the earth's surface belonging to the British Empire are printed in red; and you will see that quite a large part of Africa is colored red. Africa is rather like the head and neck of a rhinoceros in shape; with its horn stuck out on the east, and the tip of its nose down south at the Cape of Good Hope. The back of the neck is the coast of the Mediterranean Sea, and the throat is the Guinea Coast. The Equator, the imaginary line which goes round the middle of the world, and is everywhere just the same distance from both the North Pole and the South Pole, divides Africa into a northern half and a southern half.

Now, you will see that there are some red bits on the throat of the rhinoceros, and that his whole nose is red, and a big red patch runs up north from his nose, which stops at some large lakes. Further north there is another red patch; and in some maps the top of the head behind the horn is marked red, too. This last bit is Egypt. Here, however, we shall not talk about Egypt, because it is not really a part of the empire, although the English control the government there at present, and are likely to go on doing so for some time to come. Now, until about a hundred years ago there would have been no red patches—nothing more than some little red marks on the Guinea Coast. Before that the Dutch had planted a colony at the Cape of Good Hope, which is the country we mean when we speak of "The Cape." But other European nations had taken possession of stations on the coast that they might trade with the natives and make an expedition now and then inland. It did not seem worth while to do more, because these places were hot and unhealthful; and people who tried to go inland found it hotter and more unhealthful. Besides, the natives were all savages with whom there was not much trading to be done. So that very little indeed was known about Africa—except Egypt and the countries which lie along the shores of the Mediterranean Sea.

But things are very different now, for during the second half of the nineteenth century many bold travelers, several of them Christian missionaries, made exploring expeditions, and did their best to make friends with the natives, as we have read in the part of our book beginning on page 297. And so it was found out that if Europeans set about the business in the right way some good might be got out of Africa after all. Therefore, the nations of Europe made agreements together that, instead of fighting one another

to get the biggest share, each should have a settled portion, which is called a Sphere of Influence, in which it might do pretty much what it liked as long as it did not interfere in the sphere of influence of someone else, and did not break certain rules which everyone feels to be just and necessary in the treatment of the natives.

THE THREE GREAT PARTS OF AFRICA THAT BELONG TO THE BRITISH EMPIRE

So there are three divisions of those parts of Africa which belong to the British Empire. First, there are the little portions on the Guinea Coast, which have been British for a long time, but have had more territory added to them. Then there is the nose, in the south, where there are a great many white people; and, thirdly, there are the lands in the interior which are in the British sphere of influence, where there are not many white people yet, and perhaps never will be—at any rate, until some way can be found of preventing them from getting diseases which are much more fatal to Europeans than to races which have lived in tropical climates for hundreds or thousands of years. But they have been there only a very short time as yet, so that they may still find out ways of making it more possible to go on living there.

Africa is so big, and there is still so much of it where only a very few white men have ever been, that explorers still go on finding new sorts of animals; and people who like adventures go there to hunt "big game," which means big beasts that are dangerous.

THE ANIMALS THAT ROAM WILD AND FIERCE IN ALL PARTS OF AFRICA

It was not long ago that a Frenchman named Du Chaillu was laughed at for saying there were huge apes very much stronger than men; but when a few more people went where he had been, they found that Du Chaillu had told the truth about gorillas after all. There are lions, too; and in some places they are so fierce that a few years ago, when a railway was being made in the middle of Africa, two lions came and killed so many of the people at work, as well as cattle, that the railway building had to be stopped until hunters could track those lions down and put an end to them. There are other big and savage kinds of apes, called baboons, which live in herds; and rhinoceroses and elephants, which are not tamed for the service of man as they are in India, but are hunted for the sake of their tusks; and fierce, wild cattle, tall giraffes, and ever so many different kinds of beautiful antelopes. Besides these, there are the biggest of all birds, the ostriches, which do not fly at all, but run very fast; and the Europeans have made a business of bringing them together, and keeping what are called ostrich farms to breed them, much as we breed sheep and cattle. They are kept just as we keep them in California, for the sake of their beautiful feathers, which are plucked with no more hurt to the birds than the shearing of wool gives to sheep.

In all the British part of Africa, most of the natives are negroes with very black skins and wooly hair. In former times there was one kind of trade that was usually profitable, and that was the trade in negro slaves. People persuaded themselves that negroes had been sent into the world to be the slaves of white people, and that there was nothing wrong in carrying them off from their own country and selling them in other parts of the world.

THE MANY BLACK RACES THAT HAVE THEIR HOME IN AFRICA

In that way a great number of them were brought to America. There are a great many negroes in America now; many of those who are old were slaves themselves when they were children, and the rest are the children or grandchildren of slaves, whose ancestors had been captured on the Guinea Coast and taken away across the sea. The slave traffic was carried on by Englishmen, and the slaves were brought here in English ships, but it was the English who first woke up to the wickedness of it, and not only stopped the trade themselves, but persuaded other countries to stop it too.

Now, most of Africa is inhabited by these negro races. Some of them are very warlike, but others are not particularly fond of fighting. Two of the most warlike are the Zulus and the Matabele, who really come from one stock; and some others who are called Basutos are related to them. All these live in the southern part, in Rhodesia, or in Zululand, or Natal, or the part of Cape Colony next to Natal. There are other warlike

The three mud huts covered with grass in this picture are native houses of the Kaffirs in the wilder country. There are usually a number built together, forming what is called a kraal. Every native chief has several wives, and each wife owns one of these huts. We see here the enclosure where the cattle are kept fenced in.

This is the market square of the great town of Johannesburg, centre of the mining district in the Transvaal. To this square, the largest in South Africa, the Boers bring their bullock-wagons laden with farm produce.

This is Cape Town, nestling on the seashore beneath Table Mountain. The town was built by the Dutch, but the King of Holland sold it to the English. It is of great value on account of its magnificent harbor.

negroes, such as the Ashantees, who live near the Guinea Coast. But quite in the south and south-west there are other people who are not negroes, but have much lighter-colored skins, and are called Hottentots; and others —called Bushmen, or Bosjesmen, as the Dutch call them—are lighter still, and are also very small, whereas the Zulus and Kaffirs are often very tall.

How the Africans Live and What They Believe

These African races are not like the people of India, who have been civilized for thousands of years, though their civilization is different from ours. The Africans have hardly been civilized at all; they have not tried to make themselves skilful in anything except things that have to do with fighting and hunting. They never thought of building themselves anything better than what we should call huts, or of making any but the roughest kind of tools, and even now they have learned little from the Europeans. In those parts of the country where they have a good deal to do with Europeans, many of them have been taught Christianity; but most of them are still heathen, and believe more in what we should call witchcraft or magic than in anything else; and even now, where there are no Europeans to stop them, some of them are cannibals.

The People Who Have Gone to Africa from Other Lands

It is only in the south, where the climate is temperate and the air is wholesome, that there are plenty of Europeans, and large towns and farms; and even there we do not see much of the kind of manufacturing industries which we have in America. But while we have many different kinds of mines, in Africa there are gold-mines and diamond-fields, the discovery of which began about the middle of last century. And that discovery drew a great many more Europeans than before into South Africa. And besides Europeans, the gold-mines some years ago brought in a number of people of quite another race, the Chinese, because people thought they would be more satisfactory as laborers in the mines than either Europeans or negroes. But there are other people who do not want the Chinese at all, and as most of them have returned to their own country they really do not count as part of the African population.

On the Gold Coast there are always a few white people, and some troops who are like the Sepoys in India, except that they are black instead of brown, under the command of white officers, and there are a good many natives who have learned to live in a civilized way. Along other parts of that coast there are French or German territories too, which are very much like the English.

But much the most important part is the southern region, which is now a union or dominion, where there are hundreds of thousands of white people, all under the British flag, governing themselves like the other great dominions of Canada and Australia. There are large towns, such as Cape Town and Durban and Johannesburg and Pretoria and Bloemfontein and several others.

The White Colonies of South Africa and How the Dutch Came There

The Union which is known as the Union of South Africa is made up of four provinces: the Cape of Good Hope on the south, Natal on the east coast, the Orange Free State north of the Cape of Good Hope and east of Natal, and the Transvaal, which lies northward across the Vaal River; but is divided from the sea by Portugese territory. Bechuanaland west of the Orange Free State and the Transvaal, Rhodesia north of the Transvaal, and two small territories called Swaziland and Basutoland are also British possessions.

The Portugese were the first Europeans to discover South Africa. Bartholomew Diaz sailed round the Cape of Good Hope in 1488, the year that Columbus sent his brother to England to ask for aid from Henry VII., and in 1497, the year that John Cabot discovered Newfoundland, Vasco di Gama sailed into Table Bay. An English fleet paid a visit to Table Bay and took possession of it the same year that the Pilgrim Fathers landed on Plymouth Rock, but no attempt was made to colonize the country by any nation until 1652, when the Dutch built a fort which made the beginning of Cape Town. The sailors from a ship that had been wrecked in Table Bay had brought home so good a report that the Dutch East

India Company thought it was a good place for their ships to stop and break the long voyage to and from the East Indies. Gradually the little settlement grew larger, and about a hundred and twenty-five years later it was joined by a few hundred French Huguenots.

The colony was under the rule of the Dutch East India Company, whose government was tyrannical. The Boers, as the Dutch farmers were called, had very little freedom, and in an effort to escape from, what would seem to us, the oppression of their governors, many of them "trekked" outside the bounds of the settlement. When the Napoleonic wars broke out, Holland, as we have learned, fell under his rule. As England was at war with Napoleon, the British ships attacked Cape Town and took possession of it. But this was done in the name of the Prince of Orange, as the ruler of Holland was then called, and when peace was made the colony was given back to Holland. A few years after war again broke out with Holland on the side of France, and the colony was again taken by the British. This time they kept it; but paid Holland a large sum of money just as the United States paid for the Phillipine Islands after the Spanish war. At this time the Cape of Good Hope had not half so great an area as the province has now, and there were only 27,000 white people scattered through it.

How the Transvaal and Orange Free State were founded

The new government was much fairer and better than the rule to which they had been accustomed, but many of the Boers did not like the change, and when, about twenty years later, slavery was abolished in all British possessions, they liked it still less. They believed they had the right to keep the natives in slavery, and as most of the Boers were farmers who had large herds of cattle, they did not see how they could do without their Hottentot slaves. They felt, too, that the sums of money allowed to them for freeing the slaves was not sufficient. Beside all this, their treatment of the natives, especially of the Kaffirs who fought against them and stole their cattle, was harsh, and they did not like rules that were made to compel them to be more kindly. Because of all these grievances, some of the Boers again began to trek, and in all about four thousand left Cape Colony with their wives and children, their flocks and herds. Some of them stopped in the country beyond the Orange River, and others went on until they crossed the Vaal River, and this was the origin of the Orange Free State and the Transvaal.

When the Matabele, who were great warriors, and had conquered that country, attacked them, they defeated them; and the Matabele fled, leaving the Boers to form two republics in peace. Afterwards these two Boer Republics came to be called the Orange Free State and the Transvaal. The going away of these Boers out of Cape Colony is known as the Great Trek.

The second British colony, Natal, was founded partly because of the Great Trek. For in those days most of that part of the country was ruled over by a Zulu king called Dingan. The Zulus, like the Matabele, were great warriors, who conquered the more peaceful tribes and forced them to do their bidding. But when the Boers had gone up into their new lands, they still wanted to be able to reach the sea, so some of them crossed the Drakensberg Mountains, and sent a few of their number to ask Dingan to permit them to settle in his country.

How the Boers were betrayed and how they triumphed on Dingan's Day

Dingan received them in a friendly way, but just as the envoys were leaving he had them murdered, and then sent off his warriors to destroy the rest of the Boers who had crossed the Drakensberg. Most of the Boers got warning in time, and made what is called a laager by drawing their wagons together round their camps so that they could shoot from behind the wagons. Many of them were killed but reinforcements reached them, and when the Zulus came the Boers won a great vistory, which is remembered as "Dingan's Day." After that the Zulus had a new king named Panda, who was more friendly. When the Boers had settled themselves they began to ill-treat some of the Kaffir tribes; and then the Government at Cape Colony said that, after all, the Boers were British subjects, though they were not living in British territory, and could not object to the British setting up their own government

there—which they did. But the Boers did not want to be under British government; they went back over the Drakensberg, and left Natal to the British.

THE BRITISH, THE BOERS, AND THE NATIVE TRIBES

Now, the British did not want to be troubled with the two Boer States which had been set up beyond the Orange River and the Vaal River. The Boers in the Orange Free State had a great deal of trouble with the chief of some native tribes called the Basutos; and at last the British arranged terms between the Boers and the Basutos, and said that the Basutos must obey the British. The Boers were to govern themselves in the Orange Free State, but were still to recognize that the British had a right to interfere whenever they thought that interference was necessary. Very much the same thing happened in the Transvaal.

A few years after this diamonds were discovered, and made the land in which they were found valuable. This land was chiefly inhabited by Griquas, a people who were of part white and part Kaffir descent. The Orange Free State claimed the territory, and a dispute arose which was only ended when the British government took over the land and paid the Orange Free State $450,000 for any claim that it might have. It was about the same time that the British began to push up through Bechuanaland, and on into the Matabele country beyond the Transvaal. This was done under the influence of Mr. Cecil Rhodes, a young Englishman who had begun to dream of a British Empire in South Africa, and of a great railway that should join the north and the south. That is why so much of the country was given his name—Rhodesia.

HOW BRITISH POWER BEGAN IN THE BOER REPUBLICS

But before Cecil Rhodes had set to work, when the English had just taken possession of the diamond-fields in the south of Bechuanaland, some important events happened. The Boers in the Transvaal were not so prosperous or so well governed as those in the Orange Free State, and they had serious quarrels with the Zulu king, Cetewayo, who ruled north of Natal. Cetewayo appeared to care so little about the whites, and the Transvaal seemed so little able to defend itself, that the British sent an army, and declared the Transvaal British territory.

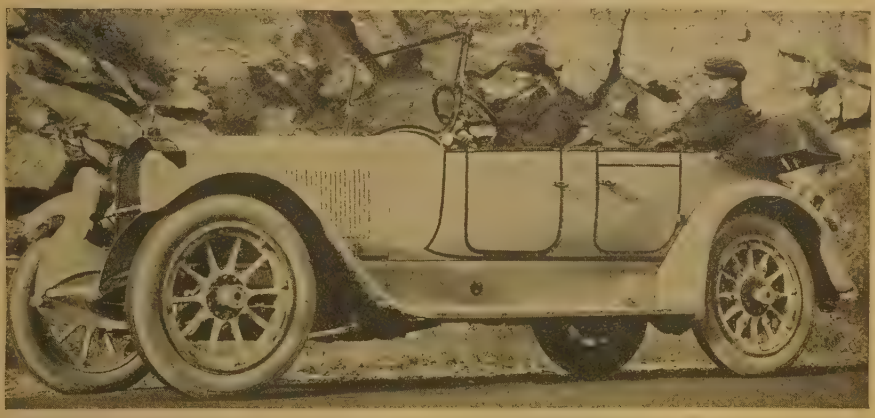
But then the Boers in the Transvaal resolved that they would not have a British Government, and they took up arms, and won a victory over the British at Majuba Hill. Then there were so many people in England who said that, after all, the Boers were in the right, and had done exactly as they would have done in their place, that the British gave them back the Transvaal, and allowed them to establish their Republic again; but they did not make the Boers see that this was done because they thought it was just, and the Boers grew to think that it was done because the British were defeated and were afraid. And later on very great trouble came out of that.

THE UNION BETWEEN BRITONS AND BOERS THAT FOLLOWED ON THE WAR

Gold-mines were found in the Transvaal, and a great many British subjects went there to get gold out of the mines. But the President, Paul Krüger, said that the "Uitlanders," as they were called, must pay heavy taxes, and the Uitlanders said that, if they did, they ought to have a share in the government, which the Boers would not allow them. And as President Krüger was using the money he got to buy guns and instruments of war, people began to think that he really intended to make the Boers master of all South Africa. So a great war arose in 1899, and went on for nearly three years.

Now, that war had made it clear that there would never be any certainty of peace in South Africa if there were two independent Boer States in the middle of the British dominions, and the Free State and the Transvaal were made parts of the British Empire. But because the British believe that people who are so nearly akin to themselves can never be ruled over as subjects, they resolved that they should have just the same rights as Englishmen or Scots, when once the country had been brought into order after the war. And just as England and Scotland became a united nation, and English and Scots a united people, after they had been fighting each other for centuries, so in 1910, the four states, two British, two Boer, were joined in the Union of South Africa.

THE NEXT STORY OF COUNTRIES BEGINS ON 1931.



WHAT MAKES A MOTOR-CAR GO?

CONTINUED FROM 1656

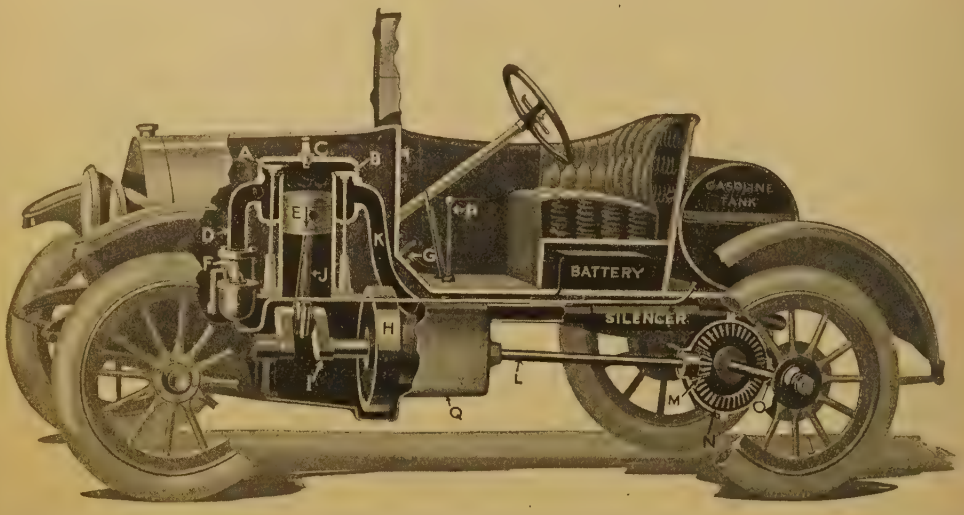
THE mystery of the motor-car is a mystery that has only lately dawned upon millions of people, but it is, of course, only the old question of using natural forces for power. In nearly all motor-cars it is a gas that makes them move. In one way or another this gas is made in the engine of the motor-car or is sent into it, and, as this gas is made under pressure, its atoms fly about in all directions, and so press upon that part of the engine which is connected with the wheels. In most motor-cars gasoline is burned with air, which is admitted to the inside of the engine, and the gases which are produced by this burning make the motor-car move. Gasoline is really a vegetable product and has in it the power which poured upon the earth from the sun ages ago. It is really the sun, then, that makes the motor-car move; not the sunlight of to-day, but the stored-up sunlight of long ages ago.

In steam motor-cars the power is produced as it is in a railway engine or a steamboat. Something is burned—it is generally gasoline—and so boils water, and it is the water-vapor or gas that acts on the engine in this case, just as the gases made by the burning of the gasoline act upon the engine in the commoner kind of motor-cars. Electricity is used in ordinary motor-cars to set the gasoline burning. Each time the spark passes, a little dose of gasoline is burned, and it is this burning of gasoline that makes the noise that we hear, or part of it. Other cars which are driven directly by electricity move more quietly than those driven by gasoline or steam.

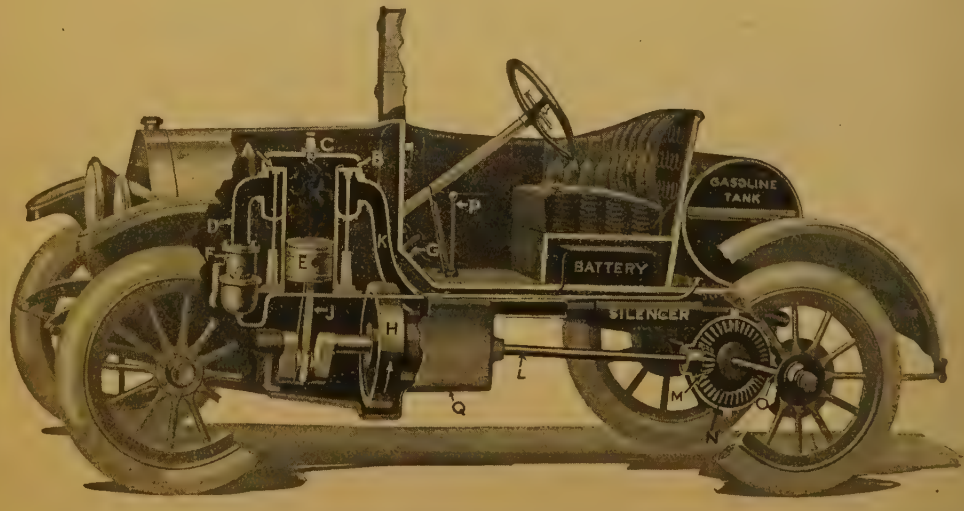
HOW BIG IS SPACE?

Well, how big is this question? said the Wise Man. Men have been thinking about it ever since men began to think. If we think about it for ourselves, we shall see that it is impossible to think of space as anything but infinite—something going on for ever. For suppose that with a telescope we could pierce right through space until we came to a great wall, and that was the end of space; yet on the other side of that wall there must be more space, however far away the wall was, and if there were another wall beyond it, there would be more space beyond that. It is impossible to think of space as anything that stops. If there were a boundary no further away than the wall of your room, or a boundary so far away that even light would take a billion years to reach it, in either case we cannot

WHAT MAKES A MOTOR CAR GO



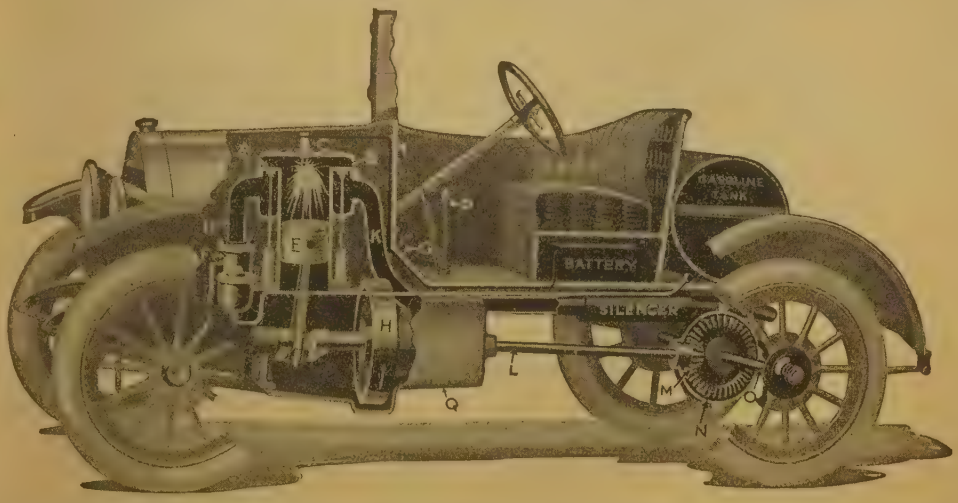
The works of a motor car seem hopelessly puzzling, but the machinery which makes it go is really very simple. Here is a car with part of the side broken away. A regular motor car has four, six, eight, or even more, cylinders in its engine, but we show only one for the sake of clearness. A motor boat or a motor cycle works in the same way. The inlet valve A is open ready for the gas to rush in; B is the exhaust valve through which the used up gas is forced out; C is the sparking plug with a wire running to the batteries under the seat; D is the inlet pipe through which a mixture of air and gasoline vapor passes; E is the piston, which slides up and down in the cylinder and is connected by the piston rod J to the crankshaft I. The cylinder is shown here much enlarged, and the cooling arrangement is omitted.



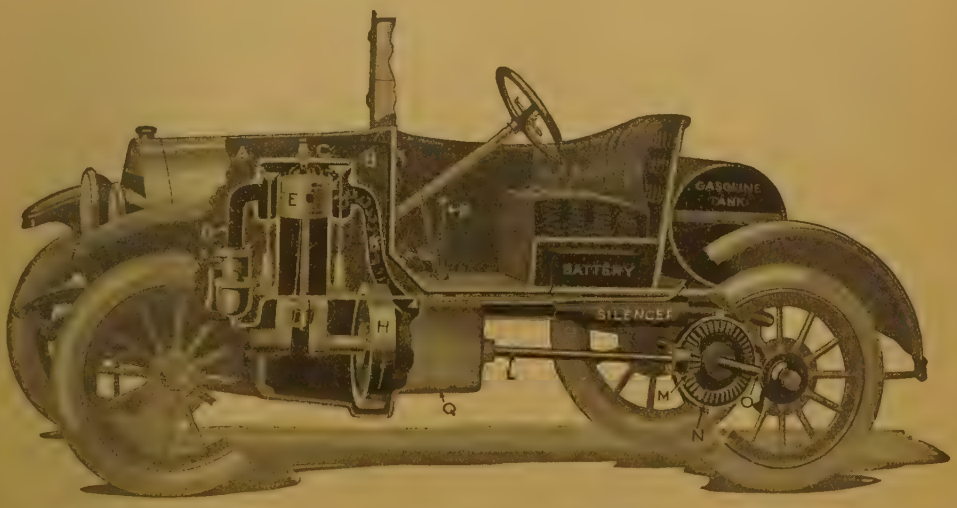
Now let us see what happens when the crank in front of a car is turned, or the button G of the electric starter is pushed. Either of these things makes the flywheel H turn, which pulls the piston E to the bottom of the cylinder, creating a vacuum. Gasoline from the tank back of the seat in passing through the carbureter F is broken up into a fine spray and mixed with air. This mixture, which is a very explosive gas, rushes through the pipe D and the valve A and fills the cylinder. When the piston E reaches the bottom both inlet and outlet valves are closed, and the flywheel as it continues to revolve pushes up the piston and compresses the gas which has been drawn into the cylinder into a much smaller space.

The diagrams on this page and the following are copyrighted, 1918, by The Grolier Society.

WHAT MAKES A MOTOR CAR GO



When the piston E has reached the top and the gas has been compressed into a very small space, the sparking plug C at the top of the cylinder is arranged to give off a spark. The compressed mixture of gasoline vapor and air instantly explodes and drives down the piston with tremendous force. This explosion furnishes the energy to move the car. The same thing is going on in the other three, five, or more cylinders of the car, but the explosions are arranged to take place at different times, so that the flywheel turns smoothly and continuously. The piston rod which is connected with the crankshaft makes the flywheel spin around swiftly, and as it turns it pushes the piston up again. Without the flywheel the piston might stop at the bottom of the cylinder after the first explosion, and the engine would stop.



As the piston starts upward again after the explosion the outlet valve opens and the used up gas is forced out through the exhaust pipe K. The silencer or muffler destroys much of the noise of the explosion. This used up gas causes the odor you get after a car has passed. The flywheel continues to turn and the piston starts down again and draws more gas into the cylinder, ready for another explosion. The flywheel and the crankshaft can run without moving the car, or can be connected with the shaft L in the transmission box Q. The shaft L by means of cogwheels M and N turns the rear axle O, and makes the car move. Whether the car stands still while the engine runs, goes backward or moves forward at low, intermediate, or high speed is governed by the lever P which you see in the body of the car.

think that there is nothing beyond the boundary; there must be more space. We often say that one telescope has so much space-penetrating power, that another has three times as much power, and so on. Yet, if we could make another telescope with such space-penetrating power—which really means the power to let us see light coming from such a great distance—that the biggest telescope we have, compared with it, would only let us see as far as a worm could see, that telescope would be no nearer bringing us to the end of space than the sight of the worm is. If a thing is infinite you are no nearer the end of it than you were before, however far and fast you go. A great man has said that this idea of infinite space sometimes impressed his mind so much that he dared not think of it. Yet there is in it nothing to make us afraid, but only to make us thoughtful.

How big is the world of stars?

This is an utterly different question from the last one. Knowing that space must be infinite, men used to think that the world of stars must also be infinite, that however far we went through space we should still find more and more stars. But many men now think that this is not so. It seems to be the case that when we examine the world of stars—our universe, as we may call it—with the telescope, we find that after a time the stars become thinner and fewer, and that in many parts of the sky we can, so to speak, see right through them, and see nothing beyond. Thus, it is probable that our universe of stars—of which our sun is one—is not infinite, but has a limit. There may be any number of other universes like it or unlike it. There is no limit to space, and there is no limit to the power of God.

But our universe, or world of stars, big though it be, probably has a limit, just as the solar system has a limit. The size of it has even been guessed at, and it has been said that the distance across is perhaps the distance that light would travel across in thirty thousand years. If you like to measure the number of miles for yourself you can; but I fancy it would take most of this page to print it. When they speak of these great distances, astronomers do not speak of miles, for miles are too small to count with. They take the distance that light would travel across in a year—you know that it travels 186,000 miles in a second—and they call that distance "a light year." Perhaps the universe is 30,000 "light years" across. If you have a big enough piece of paper, here is your chance for a problem!

Which travels quicker—heat or cold?

One of the wisest men who ever lived, Francis Bacon, said that the business of knowledge is often not so much to answer questions as to know what questions to ask and how to ask them. The great business for us, he said, is "rightly to put the question to Nature." This deserves a place among the wisest things that have ever been said. It is just when we learn how to ask a question that we gain more knowledge, and that is equally true, whether we can answer the question or not. Often men have learned great things simply because someone has said "you cannot ask that," of a question which men have been asking for hundreds of years.

Now, this question is one which we cannot ask, for there is no such thing as cold. Complete cold, if we could get it, would only be complete absence of heat; and what we ordinarily call cold is simply less heat than in something else with which we are comparing it. When a thing gets cold, it really gets less hot. So we cannot speak of cold traveling unless we mean that it is a cold wind that is traveling, or cold water traveling through hot water, as when you run cold water into a hot bath. But we can say how fast heat travels, if by that we mean the rays of heat or radiant heat that we feel near a fire or a light. This kind of heat is really the same as light, and it travels at exactly the same speed, which you know. But cold travels at no speed, for there is no such thing.

Why has every cloud a silver lining?

The reason is simply that at its edge the cloud is thinner, and much more light can get through it, and that gives it its silver lining. Some clouds, however are very thin, just like a sheet of tissue-paper in the sky, and we can scarcely notice a silver lining to them. Of course, if we went up in a balloon, above an ordinary cloud which seemed

to have a silver lining to us when we were on the earth, we should see the whole cloud bright because the sun would be shining upon it, and it would throw back or reflect the sun's light to our eyes. This is true of the darkest and blackest clouds all through the daytime. The sun is always shining, and the darkest cloud has a bright side.

The trouble for us is that we see the dark side, but we ought to know and remember that the bright side is there. Of course, as we see, all this may have a meaning that applies to the troubles of life, big and little. That is why people remind us that every cloud has a silver lining. But it is even better than that, for every cloud has a silver side just as bright as the other is dark. I think some people's minds are always like our eyes in a balloon. They seem to see every cloud on its silver lighted side. These are the kind of people that it is good to live with.

WHY DOES WATER QUENCH FIRE, IF ITS PARTS, OXYGEN AND HYDROGEN, MAKE FIRE?

The first part of the answer is that as the oxygen and hydrogen of water are already burnt up with each other, they can be burnt up no more. If you first of all separated the oxygen and hydrogen, and added the unburnt mixture of them to the fire, then there would be no doubt that they supported combustion, though there would not be much of you left to remember it; and if I thought that you had any chance of making this dangerous experiment, I would not mention it.

The second part of the answer is that water puts out fire for two good reasons. The reason that everyone can understand is that, if a thing is covered with water, the oxygen of the air cannot get at it to burn it. But that is not nearly the most important reason why water puts out fire. It is that water has a great capacity for heat, and can hold a great deal of it. It takes so much heat into itself, and so quickly, that it lowers the temperature of the burning thing so that it can no longer burn.

WHY DOES A VIOLIN GIVE A HIGHER NOTE WHEN THE STRINGS ARE PRESSED DOWN?

The shorter a string is the more quickly does it vibrate or tremble when it is plucked or when a bow is rubbed across it. When you put your finger on a violin string or "stop" it, this comes to the same thing as making the string shorter, and then, when the string is set vibrating, it must vibrate more quickly. But one note is higher than another just because the air is trembling more quickly to make it.

If you stop the string just half-way along its length, it will give out a note exactly an octave higher than it did before—a high G instead of a low G, for instance. This is because the string now vibrates exactly twice as fast as it did before it was stopped, and the note that is made when the air vibrates twice as fast as it did before is exactly an octave higher. If, now, you halve the string, you will get the G an octave higher still. If you tie one end of a piece of string and hold the other at different distances along it, you will get just the same result as when a violin string is stopped. The wonderful thing is how little pressure it requires on the string to produce the effect of shortening it, and so getting a higher note. More wonderful still is the skill of the player who can learn to move his fingers along so as to get exactly the notes that he wants.

DOES LIGHT WEIGH ANYTHING?

Sometimes I really cannot help saying "What a good question!" said the Wise Man. If light were made of a shower of little sparks or specks, as Newton thought, then each of those must weigh something. Light, however, we know, is not matter at all, but a wave in the ether. So it has no weight. But that is not the whole story. Our study of light teaches us that it ought to have the power of pressure, which, *in its results*, comes to the same thing as weight. Thus, if you have a balance, and equal weights on each side, and then make a beam of light play down on one side, it ought to press down that side of the balance, just as if a weight had been added.

This is what was taught by a great Scotsman, Clerk-Maxwell, many years ago, before this pressure of light had been proved. He was so clever that he foretold not only that there must be such pressure, but how much it must be. We can now show that pressure by experiment, and have found that his prediction of its amount—though he

had never seen it at all — was right. It is possible to prepare what is really a balance delicately hung on a thread of quartz, and to see that when a ray of light plays on one side of it, at once the balance turns as if you had touched it with your finger, or thrown something against it. This pressure, which is so like weight in its results, though it is not weight, is sometimes called light pressure. But it is common not only to the light that we can see, but also to the other radiations or rays in the ether which our eyes are not made so as to see. The proper name for it, therefore, by which it is now known everywhere, is not light pressure, but radiation pressure.

WHY DO ANIMALS IN SNOWY COUNTRIES WEAR WHITE COATS?

The use of the white coat is to protect the animal from its enemies by making it difficult to see. If the animal keeps still it can scarcely be seen at all when its coat is the same color as the snow. But if it had a white coat in summer, when the snow goes, it would be easily seen, and so often its coat changes in summer, and the fur takes other tints, more like the color of the ground and the plants among which it lives. This is called *protective coloring*, and is very useful to many animals, as we can understand from the pictures on page 3444. But sometimes it happens that an animal which lives by catching others is also white in winter snow, so that it can get near its prey without being seen. Some insects also change coloring, and when they sit quietly among the leaves of certain plants no one can tell which is insect and which is leaf, so the birds that would eat them up cannot find them.

WHY DOES SILVER TARNISH AND GOLD NOT?

There is always a good deal of sulphur in the air in one form or another, and this sulphur acts upon a good many things that may be exposed to the air. Especially we notice this where we burn gas, as that adds a good deal of sulphur to the air. No sulphur compound has any action upon gold, so gold does not tarnish. But several sulphur compounds act upon silver, covering the surface of it with a film of what is called silver sulphide, which is black. When we brighten silver, we rub this sulphide away; but of course this means that we are slowly losing the silver itself, and in time we shall notice the loss. Often people wear silver bangles or other silver ornaments next the skin. If it happens that such a person is taking sulphur as a medicine, he or she may notice that the bangle, or whatever it is, turns black. This is because some of the sulphur leaves the body through the skin, and so tarnishes the bangle by forming a film of silver sulphide on it.

WHAT IS IT THAT CAUSES RUST?

In the answer to the last question we learned that sulphur compounds act on silver but not on gold. The oxygen of the air acts neither upon silver nor gold, which, as we know, is the reason why they are called the noble metals; but it does act upon iron, especially when water is present. Somehow the water helps the oxygen of the air to attack the iron. When the surface of the iron is burnt or oxidised, it forms an iron oxide, and that we call rust. So iron is not a "noble metal."

But if we think further, we shall see that just because iron can rust it *is* the most noble and valuable metal in the world. If iron were like gold and silver and could not be oxidised, or rusted, we should not exist on the earth, nor would any green plant. It is rusted, or oxidised, iron that gives all the color to the good brown earth as well as to colored jewels, like rubies; and it is this rust which is dissolved by water, and so forms food for the plant, and gives it its green color. It is this rust also by which we get iron into our blood, and which gives it its red color.

So the life of the earth is due to rust as well as the color of the earth. We think rust a nuisance because it spoils our knives; and our forefathers would not call iron a noble metal because it was liable to rust. But we know that because iron can rust, because it can be acted upon by the air, it is the noblest metal in the world. John Ruskin says that the iron breathes the air, and so gives life to all of us, and that is a beautiful way of putting it.

WHAT BRINGS LIFE OUT OF DRIED SEEDS?

We may be sure that the life is there, or it would not come out of the seeds. The seeds are the children of plants that were alive before them, and part of their parents' life is in them. But it is quite true that a dried seed is very

different from one which is sprouting, and it is fair to say that its life is resting or passive or suspended for the time. It is alive, we know very well, for it can be killed by boiling it or by a poison or in many other ways, and a dried seed may be dead or alive, as an egg may be dead or alive.

You will never be able to get a chicken out of a dead egg, or a plant out of a dead seed, but you will get a dried seed — provided it has not been killed — to sprout if you add water to it. It is because it is dried that it seems to stop living, which is not the same thing as to die. We know that it is not the same thing, for when it gets water it shows us that it is not dead. The chemical changes which are necessary for all active life must have water, if they are to go on. The water does not make the life come out of the dried seed, but reveals it. If you have injected a drop of prussic acid into the seed first, then the water will fail to make it sprout, for it is killed.

WILL SEEDS GROW AFTER BEING KEPT HUNDREDS OF YEARS?

This is a very simple-looking question, to which the answer ought to be yes or no, and I think, said the Wise Man, that the answer is no; but it is really very difficult to be sure about it. People say that they find grains of wheat buried with an Egyptian mummy that must have been lying there for thousands of years, and that these grains of wheat, when given water, will sprout. Then other people say that, as a matter, of fact, there has been some mistake, and that these grains have somehow got in quite lately, or that there has been some fraud practised on the trustful traveler.

Some such explanation as this seems to be likely; but we simply do not know what the truth is. We might set some experiments going now which would be very interesting and valuable hundreds of years after we have gone. Only very few people will take the trouble to start an experiment unless they are to see the end of it. We know that a dried seed need not be a dead seed, but we do not know what is going on in that seed; we do not know to what extent it is breathing or taking in tiny quantities of water-gas from the air; we do not know to what extent this is necessary if the seed is to keep alive. In fact, this is one of the interesting questions that we have failed to study sufficiently yet. The importance of it is enormous, because, for instance, it might be that if seeds could keep alive for many years they might be carried through space from the world where they were born, and be planted upon another world. This has actually been suggested by such a great man as Lord Kelvin.

WHY ARE SOME PLANTS ALWAYS GREEN?

Though it is the common rule that green plants lose their leaves in the winter, when there is less sun for them to use, yet we must remember that the variety of life is infinite, and that one plant has one way of living which suits it, and another has another. Thus, some plants, which we call evergreen, develop a strong kind of leaf which lasts all through the winter, in spite of the wind and the wet, and uses the winter sun whenever it shines. Probably we shall find, at any rate in some of these cases, that the plant really belongs to a part of the world where there is plenty of sun in the winter, so that it is quite worth the plant's while to keep its green leaves all the year round. We must not think that evergreen plants are necessarily better than those whose leaves fall in the winter, for we know that the change and the fall of the leaf is not really a process of decay or of death, but a living process, meant to serve the life of the plant as well as can be.

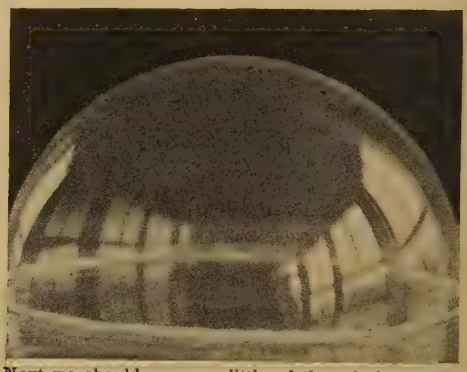
HOW DOES A SOAP-BUBBLE HOLD TOGETHER?

The soap-bubble is really a bubble of water — the soap merely helps — and the water is liquid water; but, as the bubble is made, the water is spread out into a sort of skin, and for a time, at any rate, that skin holds together because the particles of which the water is made hold on to each other and avoid the air on both sides of them. Of course, the bubble cannot last long, for the water which makes it runs down by the force of the earth's attraction until it becomes too thin, and then it bursts.

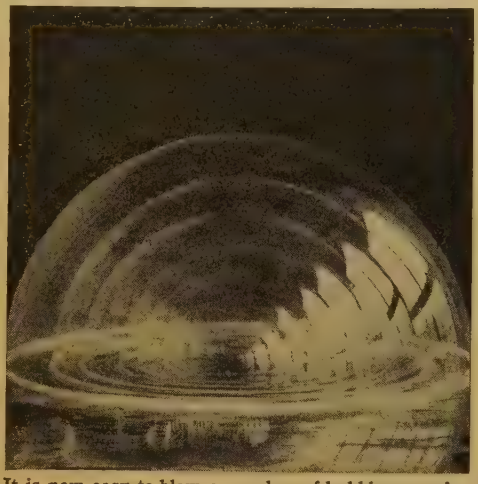
The point for us to remember just now is that the soap-bubble, like tea and sugar, and balls of mercury, and water and blotting-paper — that all these are really questions of the ways in which the surfaces of things behave when they are next to surfaces of something else. These are all really

WHAT TO DO WITH SOAP-BUBBLES

Beautiful results can be obtained from soap-bubbles. We must first make a strong lather by rubbing a piece of yellow soap in water, skim off the mass of suds from the surface, and pour the solution into a tumbler as shown. The solution must not be stirred.



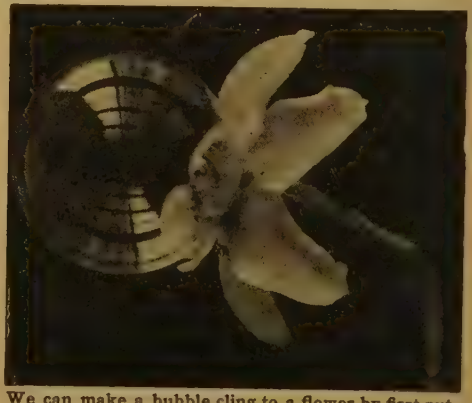
Next we should smear a little of the solution upon a sheet of glass, and blow a bubble through a straw. Then, dipping our finger into the solution, we must put it right through the side of the bubble. If we can do this without bursting it, the solution is ready.



It is now easy to blow a number of bubbles, one inside the other, on a sheet of glass, as shown in the picture. For each bubble the straw should be dipped right into the solution, for if any portion of the straw is dry, it will burst the bubbles when it touches them.

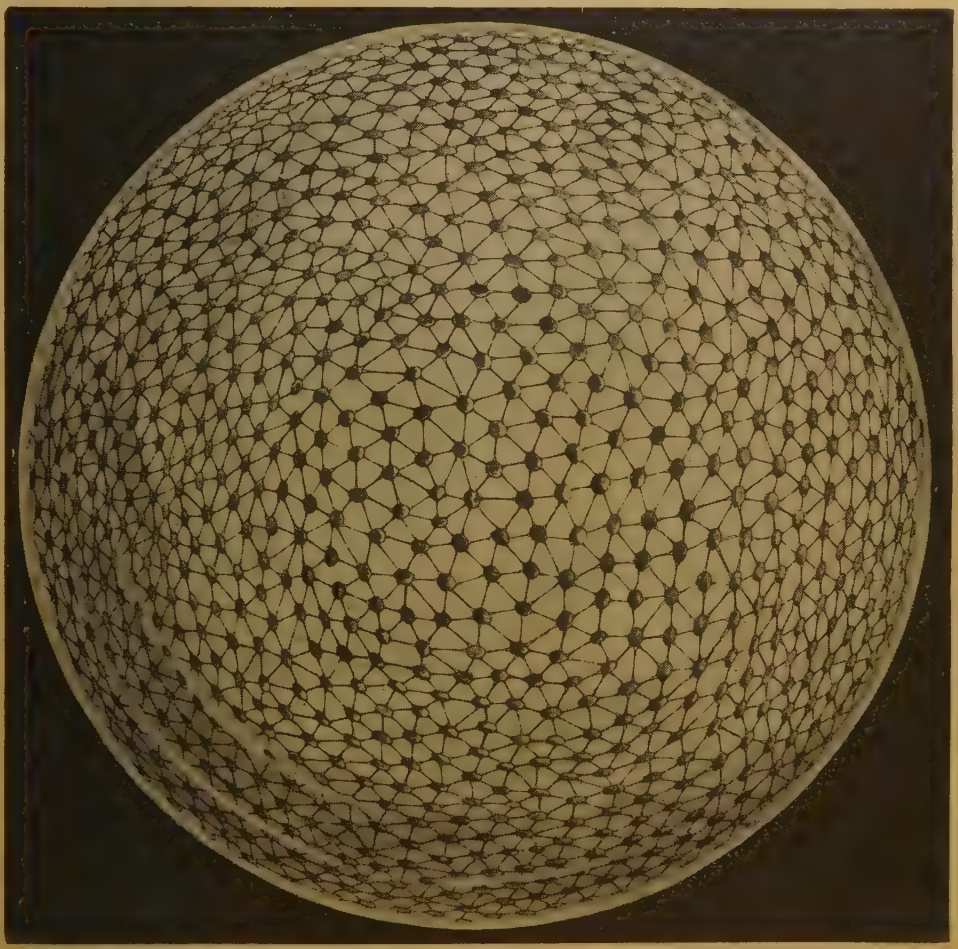
Now let us smear a glass, and an ordinary funnel, with solution, put the funnel over a little vase, and blow down the funnel, slightly raising it until a bubble is formed. Then placing a finger on top of funnel, we can turn it over until the bubble is free.

Here we see the result of the last action; this little vase is standing on a sheet of glass completely inside a bubble. Little model houses and toys can be placed inside a bubble by the funnel, in the same way.



We can make a bubble cling to a flower by first putting the flower in the solution, and then blowing a bubble through the straw on to it. Bubbles will cling to most objects that have been dipped in the solution.

questions of what men of science call *surface tension*. Tension simply means stretching, and so the name hints at the forces of stretching and holding, which are shown when the matter that makes up one surface meets another. These questions are very difficult. In



THE WONDERFUL WAY IN WHICH A SOAP-BUBBLE IS MADE TO HOLD TOGETHER

This picture shows us how a soap-bubble holds together. There are millions of tiny molecules of water, like a wonderful net of beads, blown out into ball shape by the hot air inside. Of course, no microscope could show us a bubble like this, but the picture gives us an idea of how one is made. The molecules of water should be infinitely smaller and greater in number than here, and the lines between the molecules are merely drawn to suggest the way in which cohesion draws the molecules together. There are not really any lines.

the case of sugar, or the case of a tube, for instance, we have three surfaces to study—the tube; the air; and the water, tea, or mercury.

WHY ARE SOAP-BUBBLES ROUND ?

Soap-bubbles are round for the same reason that so many other things are round. All the parts of the soap-bubble are pulling equally towards each other. We should almost think of the soap-bubble as made of millions and millions of tiny little creatures, each with arms all around it, and all these arms holding on to the arms round them. On all sides, then, and equally in all directions, there is a pull. All the little creatures, so to speak, are the same size, and have the same number of arms, and pull with the same force, as suggested in the picture. Between them, they make a sort of thing like a mattress, in the shape of a ball, but all the parts of this mattress are pulling on to each other. If the pull is uniform, the ball must be round. Of course, other things are happening. The soap-bubble, we know, is made of

matter, for which the earth has an attraction, and which has an attraction for the earth. This pulls the soap-bubble out of shape, and so, if it were possible to measure a soap-bubble very carefully, I do not think you would ever find one that was perfectly round. But if a soap-bubble could be made somewhere where there was no outside force pulling, it would be quite round.

WHY DOES A SOAP-BUBBLE RISE AND FALL?

It is quite true that if a soap-bubble lasts long enough, and does not burst too soon, it will begin to come down again after a little. The simplest explanation of this would be to remember the case of a balloon filled with hot air. It goes up, for a time, and then it comes down again. It goes up because the hot air inside it is lighter than the air round it, and being lighter, must rise, just as hydrogen would have to rise. When it cools, then the weight of the covering of the balloon brings it down again. Now, a soap-bubble is really a little hot-air balloon, for the air that fills it is warm air from our lungs, and the air is so much lighter than the air outside that it goes up with force enough to carry the weight of the water that makes the skin of the soap-bubble. But this cannot last long, for water is a very good conductor of heat, and the skin of a soap-bubble is very thin, and so the heat from our breath that is inside the soap-bubble soon escapes, and the bubble becomes as cool as the air around it. Then there is nothing to hold up the water of the bubble, and it begins to come down. It is interesting to know that the early experiments for ballooning were actually made with soap-bubbles.

WHAT CAUSES A LIGHT TO BE YELLOW?

What we call white light is made up of a vast number of lights of different colors all mixed together in just such a proportion that our eyes call it white. It is almost as if every note on the piano were played at once — with the difference that if this were done our ears would call the sound unpleasant; whereas, when our eyes see all these different kinds of light at once, the result is pleasant. The reason why it is pleasant is that this is the kind of light which the sun gives, and so through long ages our eyes have become suited to it. Now, yellow is just one of the colors that go to make up white light. The waves that make it are quite well known, and are rather low down in the scale of color, like a low note on the piano; while blue, for instance, is high up in the scale, like a high note. Though we say that the sun gives white light, yet really there is rather too much yellow light in sunlight for the result to be quite white.

WHY ARE BIRDS' EGGS OF DIFFERENT COLORS?

We know, of course, that the differences in color depend upon the presence in the various shells of various coloring substances or pigments, and it is very interesting to see how a particular kind of bird always produces the same kind of color in its eggs, just as it produces a particular kind of color in its own feathers. I do not think that the particular kind of food the birds feed on, nor yet the particular surroundings it lives in, have much to do with the special color of its eggs. This must really depend upon the particular chemistry of the body of the bird. I do not mean that you cannot change the color of hens' eggs, for instance, by food, but you will never get a hen to lay a speckled green egg. The color of the shell is really as special to the particular bird as any of the things by which we know one bird from another.

WHAT USE ARE THE DIFFERENT COLORS OF BIRDS' EGGS?

If we compare the colorings and markings of a great number of birds' eggs with the places in which they are found, we discover that in a large number of cases the eggs are so like their surroundings that they are difficult to see at all unless we look quite closely. For instance, a ringed plover's egg has the same general coloring as the sand on which it lies, and it is spotted over with black dots which look like tiny shadows. This makes it difficult to see the egg at all. In other cases the blotches or markings on the eggs look like an irregular piece of dark material lying, perhaps, on the beach. Thus, the eggs of the tern sometimes look like stones or spotted pebbles, and, on the other hand, the stones themselves look so like eggs as to be easily mistaken for them at a slight distance; so that the reason for the coloring of eggs is no doubt to help them to be hidden from sight.

THE NEXT QUESTIONS BEGIN ON PAGE 1877.

THE STORY OF A BOY'S HEROISM

HOLLAND is a land where the people have continually to keep watch on the sea, as parts of the country are below the level of the water when it is high tide. In order to keep the sea from flooding the land, great banks of sand and other material were built in these parts of the country. These banks, or dykes, as they are called,—in America a "dyke" is a ditch,—had to be kept in constant repair. This poem tells the true story of how, long ago, a little boy, during a stormy night, managed, by continually pressing up handfuls of sand and earth into a small breach made in one of the dykes, to prevent the sea from widening the breach and flooding the land behind. The writer of the poem was an American author named Phœbe Carey, who was born in Ohio, in the year 1824, and was for many years very popular in America.

THE LEAK IN THE DYKE

CONTINUED FROM 1582

THE good dame looked from her cottage
At the close of the pleasant day,
And cheerily called to her little son
Outside the door at play:
"Come, Peter, come! I want to see you go,
While there is light to see,
To the hut of the blind old man who lives
Across the dyke, for me;
And take these cakes I made for him—
They are hot and smoking yet.
You have time enough to go and come
Before the sun is set."

Then the good wife turned to her labour,
Humming a simple song,
And thought of her husband working hard
At the sluices all day long;
And set the turf a-blazing,
And brought the coarse black bread,
That he might find a fire at night,
And find the table spread.

And Peter left the brother
With whom all day he had played,
And the sister who had watched their sports
In the willow's tender shade;
And told them they'd see him back before
They saw a star in sight,
Though he wouldn't be afraid to go
In the very blackest night!

For he was a brave, bright fellow,
With eye and conscience clear;
He could do whatever a boy might do,
And he had not learned to fear.
Why, he wouldn't have robbed a bird's nest,
Nor brought a stork to harm,
Though never a law in Holland
Had stood to stay his arm!

And now, with his face all glowing,
And eyes as bright as the day
With the thoughts of his pleasant errand,
He trudged along the way.
And soon his joyous prattle
Made glad a lonesome place—
Alas! if only the blind old man
Could have seen that happy face!
Yet he, somehow, caught the brightness
Which his voice and presence lent;
And he felt the sunshine come and go
As Peter came and went.

And now, as the day was sinking,
And the winds began to rise,
The mother looked from her door again,
Shading her anxious eyes;
And saw the shadows deepen,
And birds to their homes come back;
And never a sign of Peter
Along the level track.
But she said: "He will come at morning,
So I need not fret or grieve—
Though it isn't like my boy at all
To stay without my leave."

But where was the child delaying?
On the homeward way was he,
And across the dyke while the sun was up
An hour above the sea.
He was stooping now to gather flowers,
Now listening to the sound,
As the angry waters dashed themselves
Against their narrow bound.
"Ah! well for us," said Peter,
"That the gates are good and strong,
And my father tends them carefully,
Or they would not hold you long!
You're a wicked sea," said Peter;
"I know why you fret and chafe;
You would like to spoil our lands and homes,
But our sluices keep you safe!"

But hark! Through the noise of the waters
Comes a low, clear, trickling sound;
And the child's face pales with terror,
And his blossoms drop to the ground.
He is up the bank in a moment,
And, stealing through the sand,
He sees a stream not yet so large
As his slender, childish hand.
'Tis a leak in the dyke! He is but a boy,
Unused to fearful scenes;
But, young as he is, he has learned to know
The dreadful thing that means.
A leak in the dyke! The stoutest heart
Grows faint that cry to hear,
And the bravest man in all the land
Turns white with mortal fear:
For he knows the smallest leak may grow
To a flood in a single night;
And he knows the strength of the cruel sea
When loosed in its angry might.

And the boy! he has seen the danger,
And, shouting a wild alarm,
He forces back the weight of the sea
With the strength of his single arm!
He listens for the joyful sound
Of a footstep passing nigh;
And he lays his ear to the gound to catch
The answer to his cry.

And he hears the rough wind blowing,
And the waters rise and fall,
But never an answer came to him,
Save the echo of his call.
He sees no hope, no succour—
His feeble voice is lost;
Yet what shall he do but watch and wait,
Though he perish at his post!

So, faintly calling and crying
Till the sun is under the sea,
Crying and moaning till the stars
Come out for company.
He thinks of his brother and sister,
Asleep in their safe, warm bed;
He thinks of his father and mother,
Of himself as dying and dead,
And of how, when the night is over,
They must come and find him at last;
But he never thinks he can leave the place
Where duty holds him fast.

The good dame in the cottage
Is up and astir with the light,
For the thought of her little Peter
Has been with her all night.
And now she watches the pathway,
As yestereve she had done;
But what does she see so strange and black
Against the rising sun?
Her neighbours are bearing between them
Something straight to her door—
The child is coming home, but not
As he ever came before!

"He is dead!" she cries. "My darling!"
And the startled father hears,
And comes and looks the way she looks,
And fears the thing she fears.
Till a glad shout from the bearers
Thrills the stricken man and wife:
"Give thanks, for your son has saved our land,
And God has saved his life!"
So, there in the morning sunshine,
They knelt about the boy;
And every head was bared and bent
In tearful, reverent joy.

'Tis many a year since then; but still,
When the sea roars like a flood,
Their boys are taught what a boy can do
Who is brave, and true, and good.
For every man in that country
Takes his son by the hand,
And tells him of little Peter,
Whose courage saved the land.

They have many a valiant hero,
Remembered through the years;
But never one whose name so oft
Is named with loving tears.
And his deed shall be sung by the cradle,
And told to the child on the knee,
So long as the dykes of Holland
Divide the land from the sea!

MY SHIPS[1]

This poem is written by Ella Wheeler Wilcox, an American poetess. She is a busy writer for the papers in New York, but she has written many poems for adult readers and some really fine verses for young folk. "My Ships" is a charming poem which young and old alike will much appreciate.

IF all the ships I have at sea
Should come a-sailing home to me,
Ah, well! the harbour could not hold
So many sails as there would be
If all my ships came in from sea.

If half my ships came home from sea
And brought their precious freight to me,
Ah, well! I should have wealth as great
As any king who sits in state;
So rich the treasures that would be,
In half my ships now out at sea.

If just one ship I have at sea
Should come a-sailing home to me,
Ah, well! the storm-clouds then might frown;
For if the others all went down,
Still rich and proud and glad I'd be
If that one ship came back to me.

If that one ship went down at sea,
And all the others came to me,
Weighed down with gems and wealth untold,
With glory, honours, riches, gold,
The poorest soul on earth I'd be,
If that one ship came not to me.

O skies, be calm! O winds, blow free—
Blow all my ships safe home to me!
But if thou sendest some a-wrack,
To never more come sailing back,
Send any—all that skim the sea,
But bring my love-ship home to me.

THE CHARGE OF THE LIGHT BRIGADE

The charge of the Light Brigade took place at the battle of Balaclava on October 25, 1854, in the war with Russia. It was the result of a mistaken order from a commanding officer, and in twenty-five minutes more than two-thirds of the soldiers had been killed or wounded. Lord Tennyson in this famous poem has given deathless fame to the brave soldiers who went forward fearless in obedience to command, although they knew they were going to almost certain death.

HALF a league, half a league,
Half a league onward,
All in the valley of Death
Rode the six hundred.
"Forward, the Light Brigade!
Charge for the guns!" he said;
Into the valley of Death
Rode the six hundred.

"Forward, the Light Brigade!"
Was there a man dismay'd?
Not tho' the soldiers knew
Someone had blunder'd:
Theirs not to make reply,
Theirs not to reason why,
Theirs but to do and die:
Into the valley of Death
Rode the six hundred.

Cannon to right of them,
Cannon to left of them,
Cannon in front of them
Volley'd and thunder'd;
Storm'd at with shot and shell,
Boldly they rode and well,
Into the jaws of Death,
Into the mouth of Hell
Rode the six hundred.

1 From "Poems of Power," copyright, 1908, by Ella Wheeler Wilcox. By special permission of the publishers W. B. Conkey Company, Hammond, Ind.

Flash'd all their sabres bare,
Flash'd as they turn'd in air,
Sabring the gunners there,
Charging an army, while
All the world wonder'd:
Plunged in the battery-smoke,
Right thro' the line they broke;
Cossack and Russian
Reel'd from the sabre-stroke,
Shattered and sunder'd.
Then they rode back, but not—
Not the six hundred.

Cannon to right of them,
Cannon to left of them,
Cannon behind them
Volley'd and thunder'd;
Storm'd at with shot and shell,
While horse and hero fell,
They that had fought so well
Came thro' the jaws of Death,
Back from the mouth of Hell,
All that was left of them,
Left of six hundred.

When can their glory fade?
O the wild charge they made!
All the world wonder'd.
Honour the charge they made!
Honour the Light Brigade,
Noble six hundred!

COUNSEL TO GIRLS

This pretty little poem is by Robert Herrick, a well-known English poet of the sixteenth century, and has been set to music.

GATHER ye rosebuds while ye may,
Old Time is still a-flying:
And this same flower that smiles to-day,
To-morrow will be dying.

The glorious lamp of Heaven, the sun,
The higher he's a-getting
The sooner will his race be run,
And nearer he's to setting.

That age is best which is the first,
When youth and blood are warmer;
But being spent, the worse, and worst
Times, still succeed the former.

Then be not coy, but use your time;
And while ye may, go marry;
For having lost but once your prime,
You may for ever tarry.

TEARS, IDLE TEARS

The following poem by Alfred Tennyson is selected from "The Princess," and has a wonderful beauty and pathos all its own.

TEARS, idle tears, I know not what they mean.
Tears from the depth of some divine despair
Rise in the heart, and gather to the eyes,
In looking on the happy autumn fields,
And thinking of the days that are no more.

Fresh as the first beam glittering on a sail,
That brings our friends up from the under world;
Sad as the last which reddens over one
That sinks with all we love below the verge—
So sad, so fresh, the days that are no more.

Ah, sad and strange as in dark autumn dawns
The earliest pipe of half-awaken'd birds
To dying ears, when into dying eyes
The casement slowly grows a glimmering square;
So sad, so strange, the days that are no more.

Dear as remember'd kisses after death,
And sweet as those by hopeful fancy feign'd
On lips that are for others; deep as love,
Deep as first love, and wild with all regret—
O death in life, the days that are no more.

A MUSICAL INSTRUMENT

"A Musical Instrument" is considered one of the finest poems of the English poetess, Elizabeth Barrett Browning, and points out the fact that nothing that is worth while in this world is accomplished without its sacrifice and pain.

WHAT was he doing, the great god Pan,
Down in the reeds by the river?
Spreading ruin and scattering ban,
Splashing and paddling with hoofs of a goat,
And breaking the golden lilies afloat
With the dragon-fly on the river.

He tore out a reed, the great god Pan,
From the deep, cool bed of the river:
The limpid water turbidly ran,
And the broken lilies a-dying lay,
And the dragon-fly had fled away,
Ere he brought it out of the river.

High on the shore sat the great god Pan,
While turbidly flow'd the river;
And hack'd and hew'd as a great god can
With his hard bleak steel at the patient reed,
Till there was not a sign of a leaf indeed
To prove it fresh from the river.

He cut it short, did the great god Pan
(How tall it stood in the river!),
Then drew the pith, like the heart of a man,
Steadily from the outside ring,
And notch'd the poor dry empty thing
In holes, as he sat by the river.

"This is the way," laugh'd the great god Pan
(Laugh'd while he sat by the river),
"The only way, since gods began
To make sweet music, they could succeed."
Then dropping his mouth to a hole in the reed,
He blew in power by the river.

Sweet, sweet, sweet, O Pan!
Piercing sweet by the river!
Blinding sweet, O great god Pan!
The sun on the hill forgot to die,
And the lilies reviv'd, and the dragon-fly
Came back to dream on the river.

Yet half a beast is the great god Pan,
To laugh as he sits by the river,
Making a poet out of a man:
The true gods sigh for the cost and pain—
For the reed which grows nevermore again
As a reed with the reeds in the river.

WEIGHING THE BABY

This little poem was written by Ethel Lynn, and some of the baby's own charm has crept into its verses.

HOW many pounds does baby weigh?
"Baby" who came a while ago;
How many pounds from crowning curl
To rosy point of the restless toe?
Nobody weighed the baby's smile,
Or the love that came with the helpless one
Nobody weighed the threads of care
From which a human life is spun.
Nobody weighed the baby's soul,
For here on earth no weights there be
That could avail; God only knows
Its value through eternity.
O mother, sing your merry note!
O father, laugh but don't forget
From baby's eyes looks out a soul
To be in Eden's light reset!

THE HAPPIEST LAND

The poet Longfellow has adapted the following ballad from a German original. It illustrates the vanity of earthly joys.

THERE sat one day in quiet,
By an alehouse on the Rhine,
Four hale and hearty fellows
And drank the precious wine.

The landlord's daughter filled their cups,
Around the rustic board;
Then sat they all so calm and still,
And spake not one rude word.

But when the maid departed,
A Swabian raised his hand,
And cried, all hot and flushed with wine,
"Long live the Swabian land!

"The greatest kingdom upon earth
Cannot with that compare;
With all the stout and hardy men,
And the nut-brown maidens there."

"Ha!" cried a Saxon, laughing—
And dashed his beard with wine—
"I had rather live in Lapland,
Than that Swabian land of thine!

"The goodliest land on all this earth,
It is the Saxon land!
There have I as many maidens
As fingers on this hand!"

"Hold your tongues! both Swabian and Saxon!"
A bold Bohemian cries;
"If there's a heaven upon this earth,
In Bohemia it lies.

"There the tailor blows the flute,
And the cobbler blows the horn,
And the miner blows the bugle,
Over mountain gorge and bourn."

And then the landlord's daughter
Up to Heaven raised her hand,
And said, "Ye may no more contend—
There lies the happiest land!"

THE RETIRED CAT

William Cowper, the gentle and observant poet of domestic life, though not often given to humor, has a sly touch of that quality in this charming poem about his cat, which got shut in a drawer, and by doing so gave its master an opportunity to point an excellent moral not only for cats but for all of us.

A POET'S cat, sedate and grave,
As poet well could wish to have,
Was much addicted to inquire
For nooks to which she might retire,
And where, secure as mouse in chink,
She might repose, or sit and think.
Sometimes ascending, debonair,
An apple-tree, or lofty pear,
Lodged with convenience in the fork,
She watch'd the gardener at his work;
Sometimes her ease and solace sought
In an old empty watering-pot;
There, wanting nothing save a fan
To seem some nymph in her sedan,
Apparel'd in exactest sort,
And ready to be borne to court.

But love of change it seems has place
Not only in our wiser race;
Cats also feel, as well as we,
That passion's force, and so did she.
Her climbing, she began to find,
Exposed her too much to the wind,
And the old utensil of tin
Was cold and comfortless within.
She therefore wish'd, instead of those,
Some place of more serene repose,
Where neither cold might come, nor air
Too rudely wanton with her hair;
And sought it in the likeliest mode
Within her master's snug abode.

A drawer, it chanced, at bottom lined
With linen of the softest kind,
With such as merchants introduce
From India, for the ladies' use—
A drawer impending o'er the rest,
Half open, in the topmost chest,
Of depth enough, and none to spare,
Invited her to slumber there.
Puss, with delight beyond expression,
Survey'd the scene and took possession.
Recumbent at her ease, ere long,
And lull'd by her own hum-drum song,
She left the cares of life behind,
And slept as she would sleep her last;
When in came, housewifely inclined,
The chambermaid, and shut it fast,
By no malignity impelled,
But all unconscious whom it held.

Awaken'd by the shock, cried Puss,
"Was ever cat attended thus!
The open drawer was left, I see
Merely to prove a nest for me;
For soon as I was well composed,
Then came the maid, and it was closed.
How smooth these kerchiefs, and how sweet!
Oh, what a delicate retreat!
I will resign myself to rest
Till Sol, declining in the west
Shall call to supper, when no doubt,
Susan will come and let me out."

The evening came, the sun descended,
And Puss remain'd still unattended

The night roll'd tardily away,
(With her, indeed, 'twas never day,)
The sprightly morn her course renew'd,
The evening grey again ensued;
And Puss came into mind no more
Than if entomb'd the day before.
With hunger pinch'd, and pinch'd for room,
She now presaged approaching doom,
Nor slept a single wink or purr'd,
Conscious of jeopardy incurr'd.

That night, by chance, the poet, watching,
Heard an inexplicable scratching;
His noble heart went pit-a-pat,
And to himself he said: "What's that?"
He drew the curtain at his side,
And forth he peep'd, but nothing spied;
Yet, by his ear directed, guess'd
Something imprison'd in the chest,
And, doubtful what, with prudent care
Resolved it should continue there.
At length a voice which well he knew,
A long and melancholy mew,
Saluting his poetic ears,
Consoled him and dispell'd his fears.
He left his bed, he trod the floor,
And 'gan in haste the drawers explore
The lowest first, and without stop
The rest in order, to the top;
For 'tis a truth well known to most:
That whatsoever thing is lost,
We seek it, ere it come to light,
In every cranny but the right.
—Forth skipp'd the cat, not now replete,
As erst, with airy self-conceit,
Nor in her own fond apprehension
A theme for all the world's attention:
But modest, sober, cured of all
Her notions hyperbolical,
And wishing for a place of rest
Anything rather than a chest.
Then stepp'd the poet into bed
With this reflection in his head:

MORAL

Beware of too sublime a sense
Of your own worth and consequence!
The man who dreams himself so great,
And his importance of such weight,
That all around, in all that's done,
Must move and act for him alone,
Will learn in school of tribulation,
The folly of his expectation.

TOM BOWLING

This song by Charles Dibdin is one of the most popular of sea songs, and deservedly so, for its pure and simple pathos.

HERE, a sheer hulk, lies poor Tom Bowling,
The darling of our crew;
No more he'll hear the tempest howling,
For death has broach'd him to.
His form was of the manliest beauty,
His heart was kind and soft;
Faithful, below, he did his duty;
But now he's gone aloft.

Tom never from his word departed,
His virtues were so rare.
His friends were many and true-hearted,
His Poll was kind and fair:
And then he'd sing, so blithe and jolly,
Ah, many's the time and oft!
But mirth is turn'd to melancholy,
For Tom is gone aloft.

Yet shall poor Tom find pleasant weather,
When he, who all commands,
Shall give, to call life's crew together,
The word to pipe "all hands."
Thus Death, who kings and tars despatches,
In vain Tom's life has doff'd:
For though his body's under hatches,
His soul has gone aloft.

THE OFFICER'S GRAVE

Henry Francis Lyte, the author of the following poem, was born near Kelso in 1793 and died in the south of France in 1847. He was a clergyman and wrote many hymns sung in all the churches, the best known of these being "Abide with me."

THERE is in the wide, lone sea
A spot unmark'd, but holy;
For there the gallant and the free
In his ocean-bed lies lowly.

Down, down, within the deep
That oft to triumph bore him,
He sleeps a sound and pleasant sleep
With the salt waves dashing o'er him.

He sleeps serene and safe
From tempest or from billow,
Where the storms that high above him chafe
Scarce rock his peaceful pillow.

The sea and him in death,
They did not dare to sever;
It was his home while he had breath:
'Tis now his rest for ever!

Sleep on, thou mighty dead!
A glorious tomb they've found thee;
The broad blue sky above thee spread:
The boundless waters round thee.

O GOD, OUR HELP IN AGES PAST

This beautiful hymn by Dr. Isaac Watts, first published in his "Psalms of David" in 1719, is generally regarded as the finest he has written. In its original form it consisted of nine verses, but has since been reduced to six. Charles Wesley, the brother of the great man who founded the Methodist Church, altered the hymn in several parts, and changed the first line to "O God, our help in ages past." This form is retained in most of the present-day collections of hymns, and is here given.

O GOD, our help in ages past,
Our hope for years to come,
Our shelter from the stormy blast
And our eternal home.

Beneath the shadow of Thy throne
Thy saints have dwelt secure,
Sufficient is Thine arm alone,
And our defence is sure.

Before the hills in order stood,
Or earth received her frame,
From everlasting Thou art God,
To endless years the same.

A thousand ages in Thy sight
Are like an evening gone:
Short as the watch that ends the night
Before the rising sun.

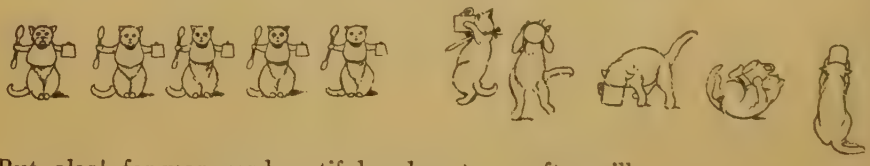
Time, like an ever-rolling stream,
Bears all its sons away;
They fly forgotten as a dream
Dies at the opening day.

O God, our help in ages past,
Our hope for years to come,
Be Thou our guard while troubles last
And our eternal home.

THE CAT'S TEA-PARTY

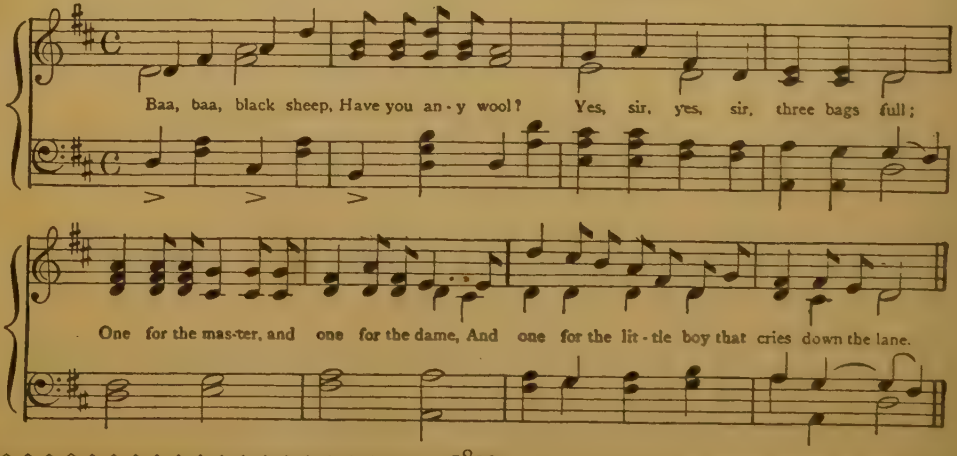
FIVE little pussy-cats, invited out to tea,
Cried, "Mother, let us go. Oh, do! for good we'll surely be!
We'll wear our bibs and hold our things as you have shown us how—
Spoons in right paws, cups in left—and make a pretty bow;
We'll always say, 'Yes, if you please,' and 'Only half of that!'"
"Then go, my darling children," said the happy mother cat.

The five little pussy-cats went out that night to tea,
Their heads were smooth and glossy, their tails were swinging free;
They held their things as they had learned, and tried to be polite—
With snowy bibs beneath their chins they were a pretty sight.



But, alas! for manners beautiful and coats as soft as silk,
The moment that the little kits were asked to take some milk
They dropped their spoons, forgot to bow, and—oh, what do you think?
They put their noses in their cups, and all began to drink!
Yes, every naughty little kit set up a meow for more,
They knocked the teacups over, and scampered through the door!

BAA, BAA, BLACK SHEEP

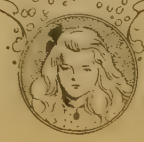

Baa, baa, black sheep, Have you an - y wool? Yes, sir, yes, sir, three bags full;
One for the mas-ter, and one for the dame, And one for the lit - tle boy that cries down the lane.

WHAT THIS STORY TELLS US

WE have already learned how and why we breathe. In these pages we read what happens to the air we breathe, and the best way to breathe well and safely. We must try to live in air that is not too warm or too moist, or that is not kept in constant motion so as to rid the body of the warm moist air that clings to it and makes us feel so uncomfortable. We require fresh air by night as well as by day—even though there are still people who think that night air is not safe to breathe. If we do not live in fresh air we are bound to suffer, for our lungs cannot protect themselves from foul air, which we were never meant to breathe, and children suffer even more than grown-up people from the effects of bad ventilation. Schoolrooms are very often insufficiently ventilated.

FRESH AIR & HEALTHY LIVES

CONTINUED FROM 1652



WE are apt, perhaps, to think that the air we breathe inwardly passes right to our lungs, but that is far from true. As a matter of fact, the amount of air we breathe in in an ordinary breath is hardly enough to fill the air-passage from the nose to the bottom of the windpipe. Even though the nose warms and moistens the air, it does not do so nearly enough to make the air fit to go right into the depth of the lungs. It is thus really only the top layer of the air in our lungs that we change every time we breathe, and the rest is done by what is called diffusion—the new air gradually passing down into the lungs, and the old air passing up. The difference between air breathed in and air breathed out can be easily stated. In the course of being breathed, air loses oxygen, whilst, on the other hand, it gains carbon dioxide, water, heat, and a small amount of waste matter from the lungs.

We give off much more carbon dioxide than usual when we take exercize, and also for some time after a meal; especially if there has been a good deal of sugar and fat in the food, for these things are quickly burnt, producing carbon dioxide. We breathe less at night, and older people breathe less than younger people. We breathe much more vigorously and more deeply and better in the presence of light—a most important fact which should never be forgotten. We breathe much more vigorously in cold weather, since we naturally require more heat in order to keep the warmth of the blood up to the mark, and breathing supplies oxygen for the fuel of the body.

It is very interesting to observe the vigor of breathing in different creatures. The small song-birds are the most vigorous breathers of all. This is not surprizing if we think of the enormous amount of work a bird does when it is both flying and singing.

The possibility of breathing at all depends upon the fact that there is more oxygen in the air outside than in the blood. and that there is less carbon dioxide in the air outside than in the blood, The interchange of the gases is only possible because this is so. It is possible to measure exactly the amount of carbon dioxide in the air, and to say at what point that amount becomes too high for safety. If we attempt to breathe air containing too much carbon dioxide, the carbon dioxide in our blood cannot get out, or cannot get out quickly enough, and we must die.

There is a cave in Italy, called the Cave of Dogs, where the air contains a great deal of carbon dioxide. Owing to the fact that carbon dioxide is heavier than air, it lies in a layer upon the floor, with the result

that a man going into the cave can breathe there because his mouth is above the level of the carbon dioxide, while a dog will fall down unconscious because its nose is below the surface of the carbon dioxide, and so it cannot breathe.

THE MISTAKEN IDEA OF THE LAW AND HOW IT SHOULD BE ALTERED

Some day the law of the land will lay down definite rules as to the quality of the air in shops, and workshops, and factories, and so on. Already there are rules as to the number of feet of space that should be allowed for each person, but these rules are not nearly enough. It is no good having many cubic feet of space for each person if the air in that space is not changed. If you put a single man in Carnegie Hall, New York, and could close the hall entirely so that no air could get in or out, the time would come—and it would not be so long as you would think—when he would be suffocated and die. At present the law thinks that it is only necessary to order so many feet of space. What it should really do is to order so many feet of space, and then order that the air in that space be changed as often as is necessary. If a man is in a room ten feet in each direction, he has a thousand cubic feet of space. The whole of the air in that space should be changed every twenty minutes if he is not to be injured. In some of the most magnificent stores in New York the saleswomen can be seen pale and tired, and without appetite, and a large number of them may soon die of tuberculosis, simply because the air is not often enough changed.

HOW GRACE DARLING DIED THROUGH SLEEPING WITH HER WINDOW CLOSED

Many of them are doubtless themselves partly to blame for their carelessness about their own bedrooms; or rather the State is to blame for not having taught them the things that matter when they were children. We know that if a single person were put to sleep in the largest bedroom in America, and the air were not changed in it at all, except by himself, it would be unfit to breathe long before the morning. Of course, the smaller the bedroom the more serious it would be; but I want to insist that even the largest room does not contain sufficient air to last through a whole night without being changed. That is why it is our duty to keep our bedroom windows open. Grace Darling, whose story is told on page 1743, died of tuberculosis, though during the day she breathed the splendid sea air, because at night she slept in a tiny little room with a closed window. After all, we have to spend about a third of our whole lives asleep, and children should spend even more than that proportion; so it is worth while making sure that we breathe pure air during that time.

Everyone should sleep in a bedroom with a window open. Rooms that have no windows, or windows that will not open, are not fit for people to sleep in. The "box" beds in which some people have to sleep in Scotland are very bad indeed, and people sleeping in them are very apt to get tuberculosis. It is best to open the window at the top, and the top sash should be pulled right down—three or four inches is not enough. This may make a draught between the window and the door or fireplace, but that does not matter at all if the head of the bed is placed out of the draught.

HOW THE CHIMNEY HELPS TO KEEP US HEALTHY

An open chimney is very good for helping to keep the air in a room fresh. When it is not used, as in summer-time, a chimney should never be closed, for this simply prevents the bad air from getting through it, and every opening of this kind to a room should be welcome. Open windows at night sometimes rattle, and people are apt to shut them then; but all you need is a couple of wedges to make the sash firm so that it will not rattle, and then you need not run the risk of spending the night in impure air.

There is a very general belief that night air is dangerous for us to breathe; but this is nonsense. Chemists have very carefully examined the air in the day and in the night, and now we know that night air is purer than day air. Fewer fires and furnaces are burning at night, and so the air in cities contains less carbon dioxide. Also, as there is less traffic, there is less dust in the air at night. We know exactly how the old belief as to night air arose, and the history of it is very interesting.

It was noticed that people who exposed themselves to the night air in certain parts of the world were very apt

to get a serious disease which was supposed to be due to the quality of the air. So, long ago this disease was called *malaria*, which simply means *bad air*, and the disease is known by that name to this day. But we have lately found that it is due to the bite of a certain kind of insect which carries the microbes of the disease, and this insect is a kind of mosquito. It only bites at night. There are no mosquitoes of this kind in England, and there is no malaria in that country except in the case of a few people who have brought it from abroad; but they cannot give it to other people, since the mosquito that carries the disease does not exist there.

So far as many countries are concerned night air is purer and better than day air, and there is nothing to be said against it. Thousands of people are killed by night air even in America, but it is the foul night air which they have made in their own bedrooms, and have not allowed to escape. This weakens their bodies in every way, and especially in such a way that the microbes of tuberculosis can enter and destroy them.

WHAT HAPPENS WHEN WE LIVE IN AIR THAT IS NOT FRESH

It is impossible to say too much good about fresh air, or to say too much about the difference between living in fresh air and impure air. So far as solid matter and microbes in the air are concerned, we have a certain amount of protection so long as we breathe through our noses, but the nose-filter, though it is quite sufficient for the kind of air we ought to breathe, is not sufficient to filter the kind of air many of us *do* breathe; and, so far as bad gases are concerned, we have absolutely no protection at all. If there is too much heat and moisture in the air of our room, and if it becomes stagnant because it is not stirred up enough, then the circulation of the blood in the skin is much interfered with.

The consequence is that we are living with our tissues and organs not working at their best. Every tissue in the body suffers, but that which suffers soonest and most is the brain, which needs pure blood even more than any other part of the body. Thus the bad ventilation of schoolrooms is one of the chief reasons why children cannot attend to their lessons, or fall asleep during their lessons, or fail to remember what they have learned. It is also one of the reasons why many children do not grow properly, for the brain presides over the growth of the whole body, and it cannot do this if it is fed with impure blood, such as many unfortunate children have to make the best of during the whole time they spend indoors, whether by day or night.

HOW BAD GASES IN THE AIR POISON OUR BRAIN AND GIVE US HEADACHE

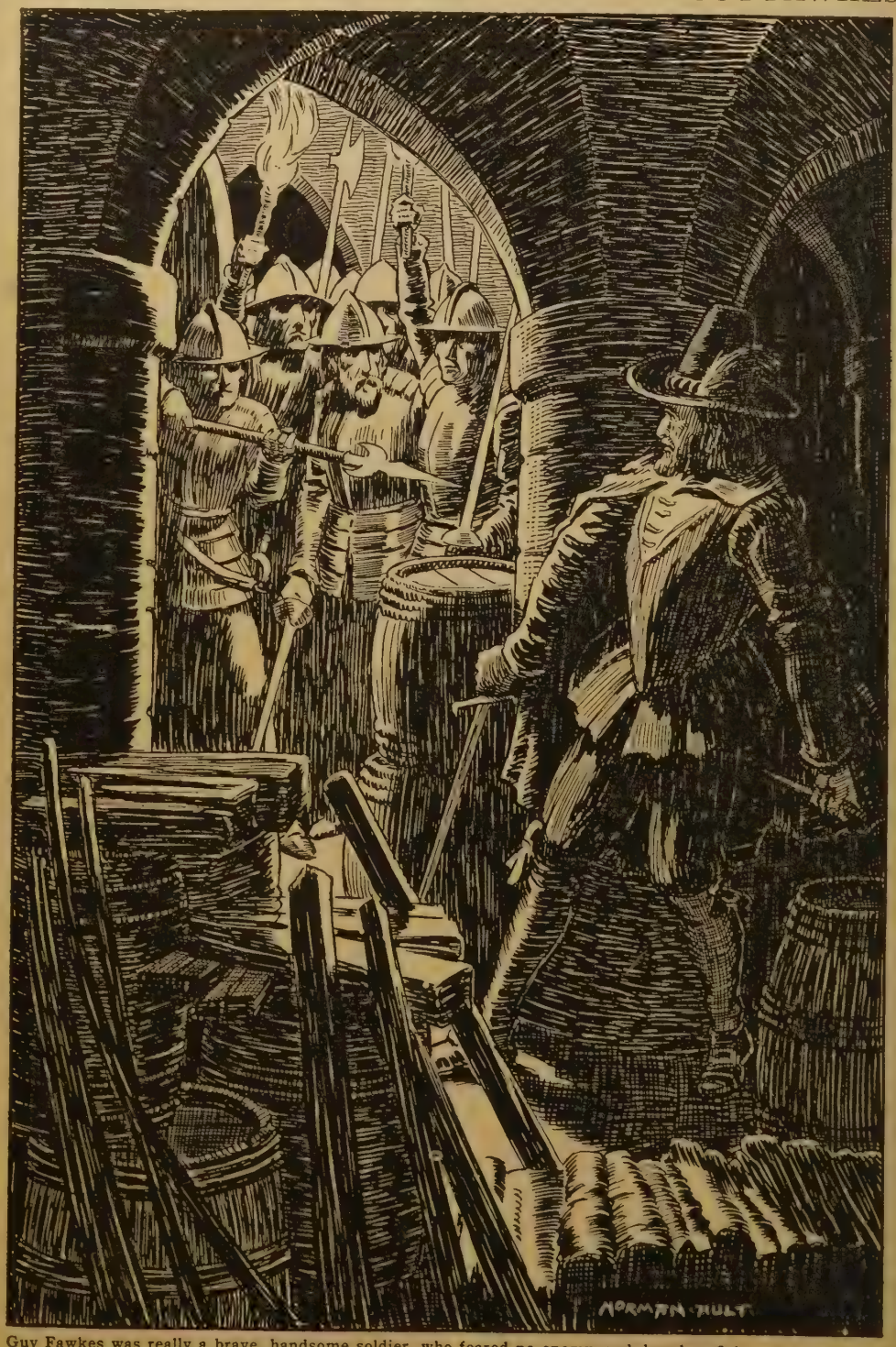
As regards the other bad gases in air, most of which have been given off by the lungs and skin either of ourselves or of others, the body has no means of protection against them at all. They pass into the blood from the lungs quite readily, the lung-cells being unable to stop them at all, and then the blood carries them to every part of the body and distributes them—to our great injury. Sometimes we can guess that something is wrong by the presence of headache or by lack of appetite, both of which show that the brain has been poisoned. But often we notice nothing at all, though the damage is being done just the same. Children left to grow in impure air suffer just as plants grown in impure air would suffer, or fishes grown in water which is not changed—and all three for the same reason.

HOW BAD AIR IS HELPING TO WEAKEN THE RACE

Many people talk nonsense about this subject. They use a long word which means that some nations are becoming smaller and weaker and stunted; that they have had their time of success, and that the nations as a whole are dying. But, as a matter of fact, babies generally are as fine now as ever they were, only people try to grow too many of them in bad air to which no rich man would expose his horses, and are not wise enough to blame themselves when they see the bad results. But, at the very least, I hope that what we have learned about the lungs and their importance for our lives will teach us how to protect ourselves from enemies, most of which can be quite easily avoided if only we have a little knowledge and are willing to apply it.

THE NEXT PART OF THIS IS ON PAGE 1921.

THE LIGHT OF THE LANTERN FELL UPON GUY FAWKES



Guy Fawkes was really a brave, handsome soldier, who feared no enemy and loved a fight. He and some other Roman Catholics in England were so angry with King James I. and his Parliament because they oppressed the Catholics that they made a plot to blow up the Houses of Parliament on the day the king opened it in person. The plot was betrayed and Guy Fawkes was captured beside the barrels of gunpowder.

Some of the friends of Guy Fawkes in his plot

GUY FAWKES AND HIS PLOT

Please to remember the
Fifth of November,
Gunpowder, treason and
plot.

Guy Fawkes, Guy! Stick him up on
high!
Hang him to a lamp-post and there
let him die!

CONTINUED FROM 1711

WHEN the yellow fogs roll up from Father Thames, drenching area railings, door-knockers, pillar-boxes, lamp-posts, policemen, and even the muffin man with his cheerful bell; and when the gas has to be lighted all day long, and every other old gentleman on the streets of London is coughing himself the color of a lobster; then it is, in this dismal month of November, that dozing old ladies, with shawls over their shoulders and mittens on their hands, start at their fireside to hear the fierce and murderous cry of "Guy Fawkes, Guy! Stick him up on high!"

Every Fifth of November, in fair weather and in foul, effigies of this Guy Fawkes are borne through the streets by boys who look like fiendish demons in their pink masks and cocked hats made out of newspaper. For three hundred years the Fifth of November has been set aside for the burning of this scarecrow guy—this hideous and comical scarecrow, which now makes the Londoner laugh, but once made his ancestors grind their teeth and mutter: "To the bonfire with him! Burn him! Burn the brute!"

But though he laughs at the scarecrow, and though his ancestors called it a brute, it represents a very handsome and dashing gentleman, who once breathed good Yorkshire air, rode a horse with grace, and could swing as long a sword as any soldier of his time. Guy Fawkes came of a good old Yorkshire family, and was a soldier who feared no enemy and loved a fight. It chanced that he once fell into intimate talk with a Roman Catholic gentleman named Catesby. Fawkes was a Roman Catholic too, and in their talk they conversed about the injustice which Catholics had to endure under a Protestant king. Catesby found the brave Fawkes hot as any man of his acquaintance against the Protestants, and very soon he laid bare to this gallant soldier a scheme for getting rid of the Protestants.

Parliament was to meet on the Fifth of November. The king would be there and all the nobility. To blow them up with gunpowder would be to get rid of Protestantism, and bring a child to the throne, who could very soon be made a good Catholic. The scheme was not so difficult as it sounded. Under the Houses of Parliament there were cellars, which merchants rented for the storing of goods. The conspirators could hire one of these cellars, could roll in barrels of

gunpowder, and on the great day someone would be found bold enough to set fire to the explosive.

Guy Fawkes at once volunteered for this post of danger. He was ready to sacrifice himself for what he considered a good cause.

Everything prospered with the idea. A cellar was found right under the House of Lords. The gunpowder was procured. Faggots of brushwood were smuggled in. There was nothing to do but wait for the day. But among the conspirators there was a gentleman named Sir Thomas Tresham, whose brother-in-law was a peer, Lord Monteagle. The thought of letting his brother-in-law go unwarned to his death stung the conscience of Sir Thomas Tresham and would not let him rest.

Late in the month of October a man in a long cloak suddenly presented himself at the supper-table of Lord Monteagle, threw down a letter, and disappeared as quickly as he had come. The letter said:

My lord, out of the love I bear to some of your friends, I have a care of your preservation, therefore I would advise you, as you tender your life, to devise some excuse to shift your attendance at this Parliament, for God and man hath concurred to punish the wickedness of this time; and think not slightly of this advertisement, but retire to yourself into your country, where you may expect the event in safety; for though there be no appearance of any stir, yet I say they shall receive a terrible blow this Parliament, and yet they shall not see who hurts them.

Lord Monteagle carried this letter to Cecil, the statesman of King James, and Cecil bore it to the King. "They shall receive a terrible blow this Parliament," pondered King James, who was said to be the wisest fool in Christendom, "and yet they shall not see who hurts them." He stroked his chin and reflected. Then a light came into his eyes; he looked up quickly at Cecil. "This smells *Gunpowder*," he said.

They kept their idea very dark. At midnight on the fourth of November a magistrate named Sir Thomas Knevett and a squad of soldiers made their way noiselessly through cellars under the Houses of Parliament.

They encountered no conspirators, and saw nothing to arouse their suspicions. On they went, the orange light from their lanterns flinging weird shadows over the low cobwebbed ceilings, the reeking walls, and the soft, damp floors.

Suddenly they came upon a cellar where, under piles of brushwood, could be seen barrels ranged side by side in great numbers. The lanterns were lifted on high. A ray of light pierced to a dark corner. There, clean-cut against the dark wall, could be seen the delicate, shadowy outline of a man's face; and nearer, the thin, shining line of a long sword. In an instant the soldiers rushed forward and flung themselves upon the conspirator, who, though he fought savagely, was soon overpowered and bound a prisoner.

"Oh, would I had been quicker!" panted Fawkes; "would I had set fire to the powder! Death would have been sweet had some of my enemies gone with me."

He was carried to the Tower. There he was put upon the rack and tortured; but though his muscles snapped and his bones cracked, he refused to tell the names of the other conspirators. He was told that they had fled and had been arrested. "Then it is useless to name them," said Fawkes, "for they have named themselves."

But his courage was in vain. One after another the conspirators were discovered, and death followed death in rapid succession. "How could you bear the thought of causing my children and so many innocent persons to perish?" asked King James. "For desperate ills there must be desperate remedies," was the reply. A Scottish courtier asked him why he had collected so much powder. "I had purposed to cause all the Scots to be blown as far as Scotland," answered Fawkes gravely.

The whole country was roused by news of the plot.

"Death to the Papists!" was the cry on every side; and if Roman Catholics had suffered before, they suffered a hundred times more afterwards.

Guy Fawkes—the gallant and brave soldier, but a misled and bigoted Catholic—was executed on February 6, 1606. We almost forget his malign and murderous intention in remembering the wonderful pleasure he has given to all sorts and conditions of boys for over three hundred years.

THE FABLES OF ÆSOP THE SLAVE

THE WOLF AND THE LAMB

ONE very hot day, a wolf and a lamb came at the same time to a mountain stream to quench their thirst.

The wolf stood higher up the hillside than the lamb; but, wanting to pick a quarrel, the wolf called out, "What do you mean by disturbing the water and making it so muddy that I cannot drink?" The lamb answered that it could not be so, because the water was running downhill from the wolf to him, and therefore could not be disturbed higher up the stream.

"Never mind," answered the wolf. "You have behaved very badly, and I

am told that you were calling me names behind my back more than a year ago." The lamb exclaimed, "But that is impossible, for it was before I was born!"

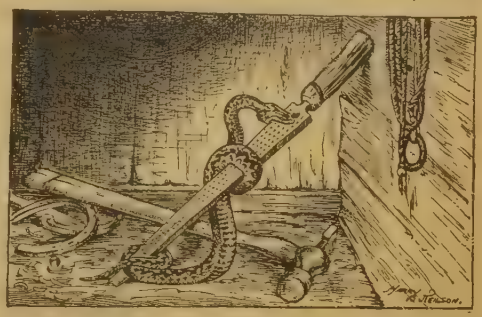
The wolf then flew into a great passion and exclaimed, "If it was not you, it must have been your father, and it comes to the same thing."

Then he seized the poor lamb, tore it to pieces, and ate it.

When anyone has made up his mind to quarrel with another, it is easy enough to find an excuse.

THE SNAKE AND THE FILE

A SNAKE one day crept into a blacksmith's shop and chanced to knock against a steel file. This hurt the snake slightly, and, flying into a rage, he at once bit the file as hard as he could. The hard steel file cut the snake's mouth; but when he saw the blood he thought it was the file that bled, and



so he bit it again and again until he had damaged his own mouth very badly.

When we try to hurt other people we are much more likely to get hurt ourselves.

THE HORSE AND GROOM

A MAN who was very proud of the horse he had charge of spent hours every day brushing its coat. But the man was not honest. He used to sell the horse's food and keep the money, and the animal soon began to grow thin, making the man angry.

"It is no use being angry with me," said the horse. "If you want me to be

a fine horse you must give me the food you are stealing from your master."

We cannot succeed well with anything unless we are honest.

JACK THE GIANT KILLER

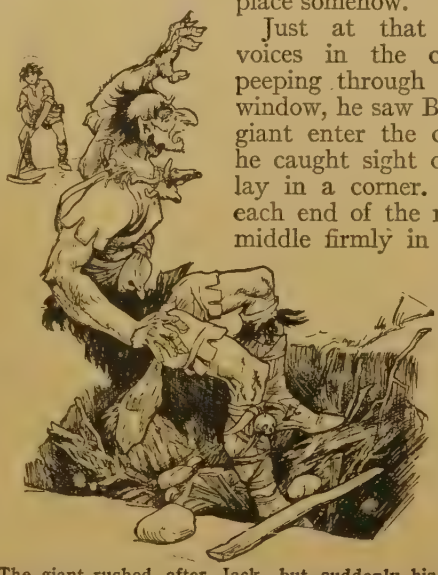
IN the days of King Arthur there lived a farmer's son named Jack. Not far away from Jack's home was a cave, and in the cave lived a horrible giant, called Cormoran.

Cormoran was three times as big as any other man; his appetite was so enormous that the only way he could get enough food to eat was by stealing all the sheep and oxen he could find. For one meal the giant could eat as much as six oxen and twelve sheep, and Jack's father said that if this went on much longer all the farmers for miles round would be ruined.

This set Jack thinking, and, being a brave lad, he determined to find a way to kill him.

So one night Jack set out for the mount in which was the giant's cave. With a spade he dug a deep pit and covered it with sticks and gravel, so that it looked like earth. Then, when all was ready, he blew a loud blast on his cow-horn and waited.

The giant awoke in a terrible rage, and came stamping down the mount to see who had dared to come so near his cave. Suddenly he caught sight of Jack.



The giant rushed after Jack, but suddenly his foot caught in the pit, and down he came, crash!

"You young rascal!" he cried in an awful voice. "I'll kill you and eat you for my supper!"

He rushed after Jack, but just before he reached him his foot caught in the pit, and down he came, crash! Up jumped Jack, and in a twinkling he drew out his axe and chopped off Cormoran's head.

Jack ran all the way home, and the farmers were so delighted at being rid of the monster that they presented the hero with a sword, and named him "Jack the Giant Killer."

Jack was so proud of his success that he determined to rid the world of another monster, named Blunderbore, who lived in a castle in the midst of a lovely forest.

Jack set out bravely, but the day was warm, and he had not gone very far when, overcome by the heat, he lay down under a tree and fell asleep. Soon Blunderbore came along, and, catching sight of Jack, he picked him up, flung him over his shoulder, and carried him to his castle.

When Jack awoke and found himself in the giant's castle, he was in an awful fright. Through the window he could hear the cries and groans of the giant's other victims, and his teeth began to chatter.

"This is dreadful," he said to himself. "I must find a way out of this place somehow."

Just at that moment Jack heard voices in the courtyard below, and, peeping through the rails of his prison window, he saw Blunderbore and another giant enter the castle. Looking round, he caught sight of a coil of rope which lay in a corner. He made a noose at each end of the rope, and, grasping the middle firmly in his hand, he flung an end over the two giants' heads. Quick as lightning he swung the rope round a beam by the window, and then, holding on to it with all his might he pulled it tight until both giants were strangled.

Jack set free all the knights and ladies whom Blunderbore had imprisoned in his castle, and set out again upon new adventures.

The next evening he found himself at the door of a lonely castle in Wales. He knocked, and, to his amazement, the door was opened by a tremendous giant with two heads. Jack was startled; but the giant seemed so friendly that when he offered him a bed for the night Jack gladly accepted.

Now, Jack knew that this two-headed monster had four valuable treasures, which he determined to possess—a coat that made the wearer invisible, a cap that told him all he wanted to know, a sword that could cut anything, and shoes that could carry him as swiftly as the wind. Jack went to bed, and

soon fell asleep. In the middle of the night he was awakened by someone singing; and this is what he heard:

"Though you shall lodge with me this night,
You shall not see the morning light;
My club shall dash your brains out quite."

"Ho, ho!" cried Jack, looking round for a log of wood which he had noticed by the fireplace. Jack put the log in his bed, and waited. Presently the door opened, and in came the giant and strode up to the bed. Down came the club—crash! again and again.

"Farewell, my young friend," he bellowed. "You'll make me a fine dinner by and by."

Jack had a good laugh over this, and when the giant had gone he crept back into bed, and was soon fast asleep.

In the morning Jack walked boldly into the room where the giant was breakfasting from a huge basin of batter pudding. The giant was so astonished at seeing Jack alive that he scarcely knew what to say to him.

Jack sat down, and began to make a good breakfast. But all the time he ate he was thinking. Suddenly a grand idea came into his mind and when the giant was not looking he hid as much of the pudding in his jersey as he could possibly get. As soon as breakfast was over, Jack said:

"You can't plunge a knife into your chest without hurting yourself. See *me!*"

Picking up a knife, Jack thrust it into his jersey, and out fell the pudding, piece by piece, upon the floor.

The giant did not like to be outdone by such a little creature as Jack, so he drew out his own knife, and, without more ado, plunged it into his chest—and fell down dead.

Then Jack caught up the cap and the shoes and the coat and the sword, and went on his way.

At the next castle to which he came a great ball was taking place. The knights and ladies, who had all heard of Jack, made him welcome, and he was just beginning to enjoy himself when in rushed a messenger to say that a hideous giant was on his way to the castle.

Jack flung the noose over the heads of the giants and held on to it with all his might and main,

"Have no fear," cried Jack, fastening on his invisible coat. "Leave all to me."

He put on the shoes which carried him as quickly as the wind, and went out.

Round the castle ran a moat, and when the giant reached the drawbridge that stretched across it he sniffed the air around, and roared in an awful voice:

"Fe, fi, fo, fum,
I smell the blood of an Englishman;
Be he alive, or be he dead,
I'll grind his bones to make my bread."

"You must catch me first," cried Jack; and, then, throwing off his coat, he led the giant a fine dance round the castle.

Jack ran on swiftly until he came again to the drawbridge. He ran across, but as he reached the other side he bent down, and with one stroke of his magic sword severed the bridge in two just as the giant was half-way across. Down crashed the drawbridge, and into the moat fell the giant; and that was the end of him.

Jack had many other adventures, and when he was tired of them all he went home again, and married a beautiful princess whom he loved dearly.

THE LITTLE PIXIES OF LAND'S END

IN the old days Land's End in Cornwall used to be crowded with pixies, elves, and goblins. All the sprites that were turned out of other parts of England because of their bad ways came to settle down in Land's End. None of them, however, ever troubled the fisherman and his wife who then lived there; indeed, they always rewarded the woman very handsomely whenever she did any work for them.

"The little people are very rich," the woman said to her husband. "I wonder how they come by all their money. Nobody ever saw them steal anything."

"Ah, more goes on in Cornwall than meets the eye," said the fisherman.

One night a pixy brought the woman a little baby elf to nurse, and gave her some strange ointment to rub on its eyes every morning.

"But don't use the ointment yourself," said pixy, "or you'll be blinded."

But the woman was very curious, and she did use the ointment. Her eyes seemed neither the better nor the worse for it. Soon afterwards, however, she paid a visit to her sister at Penzance, and as she passed through the streets she saw hundreds of pixies, elves, and goblins stealing things out of all the shops.

"Oh, look at the bold little thieves!" she said to her sister.

But her sister could not see them; and then, as the woman ran wildly about, pointing to the invisible sprites, one of the pixies blew upon her eyes, and she became blind.

THE BIRD-GIRL WITH THE GOLDEN WINGS

PRINCE Jascha was one day out hunting in the Serbian mountains, when a lovely bird with golden wings fluttered slowly past him. Full of admiration for its beauty, he thought he would try to capture it alive, and bring it home to his mother. But while trying to overtake the bird he came upon a strange sight—a high hill covered with white marble statues.

It was an awesome thing to see, but Prince Jascha was not easily turned aside from any project, and was about to climb a hill, when a hermit rushed out of a cave, crying: "Rash youth, beware!" Then, more quietly, "A witch who lives inside this hill sends out the golden bird to draw travelers within her reach. These statues were all men who, in seeking to capture the bird, came within the witch's power, and have been used by her to adorn her dwelling-place. If once she sees you she will do the same to you. Your only hope of escape is to seize her by her hair before she spies you. If you can do that, you will make her helpless."

Prince Jascha was bold, but he was not rash. Abandoning for the moment his quest of the bird, he turned and climbed the hill another way. The witch, of course, was looking for him the way the bird had come, and so he was able to creep quietly behind her, and seize her by her locks. As she felt his grip, she shrieked aloud, in such an awful voice that the hills around her rocked. But Jascha, though he was afraid, was brave, and still held on. At length the witch saw that she could not overawe him, and knowing that for evermore she would have to obey his commands, she gave up the struggle, and in a sullen voice said:

"What is it your will that I shall do?"

"I will," said Jascha sternly, "that you shall give the golden bird to me, and that you shall give these statues back their life, and restore them to their former state."

The witch submitted. First she gave the bird to Jascha, who gently kissed the frightened, trembling thing, and as his lips touched the golden feathers of its head, the enchantment in which it had been held vanished, and behold, beside him stood a lovely princess.

Then the witch breathed a blue vapor, which spread and wreathed about the hill, and as it curled around the statues, they turned back into the handsome youths that they had been before. That done, Jascha released the witch, and with one last piercing shriek she disappeared.

When she had gone, Jascha gathered the joyful group of escaped youths about him, and brought them with the golden-haired princess to Belgrade. There he married the princess, and with her he lived the rest of his life in peace and happiness.

THE NEXT STORIES BEGIN ON PAGE 1903.

WHAT THIS STORY TELLS US

BY far the greater number of all the compounds in the world belong to three great groups, called acids, alkalies or bases, and salts. If we understand how these are made we have the key to most of the chemical changes that occur, and we also learn how to understand all the chemical changes, or reactions, that are possible. Here we learn about these three kinds of compounds. It is rather hard and dry to read at first, but it is very important; and no one really has any knowledge of chemistry who has not learned what we read here. Boys and girls who like arithmetic, and have begun algebra, will not find this part so hard after all; and by studying this we understand the great principles of chemical change as it goes on for ever all over the world, and in our bodies, too.

THREE KINDS OF COMPOUNDS

THE WONDER OF ENDLESS CHANGES IN THE EARTH

CONTINUED FROM P. 1698

THERE is no limit to the number of chemical compounds. Men devote their whole lives to the study of only one group of them. But there are certain classes of compounds which we are always meeting, and to which most of the compounds we discover, or the new compounds we are learning to make, really belong. We are all familiar with such words as *acid* and *salt*, and we may have heard the word *alkali*. These words have most important chemical meanings. Compounds made in a certain way are called acids, others are called alkalies or bases, and when an acid combines with a base—as happens when we mix a Seidlitz powder—there is formed a salt.

We think of an acid as something that has a particular kind of taste like that of a lemon; and most acids have this kind of taste, though many, such as prussic acid and carbon dioxide, have not. Chemists do not think at all of the taste when they say that one thing is an acid and another is not. They say that an acid is always a compound of hydrogen. That is easy enough to begin with. But we must add that the element or elements with which the hydrogen is combined *must not be metals*. Then we find that the hydrogen of the acid can always be replaced by a metal; and then we have a salt. Let us look at a simple instance.

Though oxygen is not a metal, the compound made of hydrogen and oxygen—water—is not an acid. That is rather an exception. But let us take the element chlorine, about which we already know something. Its symbol is Cl. One atom of hydrogen combines with one atom of chlorine, forming the compound HCl. This is a typical acid, and is known as hydrochloric acid. Now, in a very simple way, as we shall shortly see, the hydrogen of this acid can be replaced by a metal, such as sodium, which has the symbol Na (the first two letters of its Latin name), and so we get a substance which has the formula NaCl, and is known as sodium chloride. This, according to what we have said, should be a salt; and it is indeed the common salt we eat every day, of which the sea is full.

If we think of almost any other element that is not a metal (or we may take more elements than one) we shall find that they form compounds with hydrogen, and that these are acids. If chlorine does so, we shall expect the other members of the group it belongs to to do so as well, and so they do. Thus we have hydrofluoric acid, HF; hydrobromic acid, HBr; and hydriodic acid, HI. None of these is quite so important as hydrochloric acid, which we all produce every day in our stomachs, but they have various uses of their own. There is no acid made of hydrogen and carbon alone or nitrogen alone, but there is one made of all three, having the formula HCN. This is hydrocyanic or prussic acid; and everyone has heard of it as a deadly poison.

Most acids contain oxygen as well as hydrogen, though none of those we have mentioned yet do so. For instance, there is an acid made of hydrogen, nitrogen, and oxygen, with the formula HNO_3, known as nitric acid.

AN ACID UPON WHICH THE WHOLE OF EUROPE AND AMERICA DEPEND FOR FOOD

It and the salts it forms are very important in themselves, and also because of their services to the vegetable world, and so to us. The whole of Western civilization at this moment depends on wheat grown with the aid of salts of nitric acid, called nitrates, which are added to the soil.

Similarly hydrogen, sulphur, and oxygen form an acid which has the formula H_2SO_4 and is known as sulphuric acid; and just as the salts formed from nitric acid are called nitrates, so the salts formed from sulphuric acid are called sulphates. They are also very important in many ways. These same elements form other acids in which the elements are combined in different proportions, such as nitrous acid, HNO_2, and sulphurous acid, H_2SO_3.

Chemistry is one of the newest of the sciences and great progress has been made in it during the last few years. At first awkward and often incorrect names were given to many substances. Hydrochloric acid was called muriatic acid. Carbon dioxide, which is CO_2, went by the names of carbonic acid and carbonic acid gas, and these names are often used even to this day. The real carbonic acid is formed by combining carbon dioxide with water. The result will be:

$$H_2O + CO_2 = H_2CO_3.$$

THE DIFFERENT POWERS OF THE ATOMS IN COMING TOGETHER

This H_2CO_3 is a true acid, as we find directly we test it. As in the case of all acids, the hydrogen of it can be replaced by a metal, and so we get a salt, which is called a carbonate. For instance, there is calcium carbonate, $CaCO_3$, one of the commonest salts in the world, which we know as chalk and marble. Then there is sodium carbonate, Na_2CO_3, which is all-important in our blood.

Here are the formulas of some of the principal acids we have mentioned:

HCl	Hydrochloric acid	HNO_2	Nitrous acid
		H_2SO_4	Sulphuric acid
HCN	Hydrocyanic or prussic acid	H_2SO_3	Sulphurous acid
HNO_3	Nitric acid	H_2CO_3	Carbonic acid

We notice that the hydrogen of an acid is always written first in its formula, and we notice that none of the elements found in these acids is a metal. We also see that in some of these acids there is one hydrogen atom to each molecule, while in others there are two. Then we might have mentioned phosphoric acid, H_3PO_4, in which there are three hydrogen atoms to the molecule. This difference between acids illustrates a very important fact about all compounds, which is that the atoms of the various elements differ in their combining power. It is as if they had different numbers of hands with which to hold on to other atoms. The hydrogen atom always has only one hand, the chlorine atom has one hand, the carbon atom has four, the nitrogen atom has either three or five, the oxygen atom has two, and so on.

HOW THE CHEMIST WRITES IN "PICTURES," OR GRAPHIC FORMULAS

The formulas of these acids illustrate this very important fact. You will not imagine that I am speaking of real hands, but it is as if each atom had a certain number of hands or hooks or whatever it is that enables it to hold on to other atoms. Thus we can now learn to write our formulas in the form of little pictures or diagrams. These are called "picture," or *graphic*, formulas. The graphic formula of water is:

H—O—H

and shows us that each of the *two* hands of the oxygen atom is holding on to the *one* hand of a hydrogen atom. Then we may write hydrochloric acid:

H—Cl

each of the two atoms having just one hand. The next acid on our list is more of a puzzle, for we remember the number of hands that carbon has, and that the nitrogen atom is sometimes three-handed and sometimes five-handed, as it were. So how do we write the graphic formula of prussic acid? Either like this:

C≡N—H

showing the nitrogen atom as having five hands, or like this:

N≡C—H

showing the nitrogen atom with three hands. In each case the carbon atom has four and the hydrogen atom one. As to which of these formulas really represents the way in which the molecule of prussic acid is built up, it is for chemists to find out by studying its

behavior when it is broken up or when salts are made.

These acids we have named and looked at are all very simple compared with the extraordinary acids which are made in and by the bodies of living creatures. For instance, there is citric acid, which we find in oranges and limes and lemons; uric acid, which is made in our own bodies; malic acid (meaning apple acid), which is found in apples; and so on. The graphic formulas of these would almost fill half this page, so large is the number of atoms in the molecule. But always we find that the acid has no metallic atoms, and that it has a certain number of atoms of hydrogen, which can be replaced by metallic atoms to form salts.

THE COMPOUNDS OF METALS, CALLED ALKALIES, OR BASES

Now we must turn to another class of compounds which we always think of as the opposites of acids. These are compounds of metals. They may or may not contain hydrogen, but they are quite different in every respect from acids. These compounds we call bases, or alkalies; and when we study any liquid in chemistry we always want to know whether it is an acid liquid or an alkaline liquid, or a liquid that is neither acid nor alkaline. There is a very easy way of finding this out in most cases. There is a dye called *litmus*, which always turns red in the presence of an acid, and always turns blue in the presence of an alkali. We put some of this dye into a sort of blotting-paper, cut it up into strips, and use it for testing the "reaction" of liquids, as we call it. We usually have both sorts of paper—blue and red. Then, if we want to find out the reaction of a liquid, we dip a piece of blue litmus in it, and find, perhaps, that it turns bright red. That proves that the liquid is acid—perhaps hydrochloric acid or nitric acid. Now, if we take that piece of reddened paper, and dip it into a solution of such a thing as ammonia, or even hold it above a bottle containing a solution of ammonia (which is really a gas), we shall find that it quickly turns blue again—proving that it has been exposed to an alkali. The good milk of a cow should give a faint acid reaction, while human milk gives a faint alkaline reaction. Thus, in feeding a baby on cow's milk, we add something to make it alkaline, as mother's milk is. Of course, a liquid may be neither acid nor alkaline, and then we say that its reaction is *neutral*. Neither blue nor red litmus, dipped in it, shows any change.

THE WAY IN WHICH THE BASES ARE MADE UP

Now we must look at the composition of some bases. One of the best known is caustic potash, a strong alkali with the formula KOH. Here we notice at once that a *metal* is contained in the compound; it is not an acid. Also we notice that it happens to contain hydrogen; but we always write the letter representing the metal first in the formula of a base, and if there is any hydrogen in it, we write the H last, to distinguish it more completely from an acid. The name caustic means burning, for caustic potash feels as if it burned the skin, and, indeed, it destroys most living tissues very quickly. Similarly there is caustic soda, which has the formula NaOH; and also slaked lime, which has the formula $Ca(OH)_2$. This last formula is rather different from any we have seen. You will notice the brackets, which are used to show that the figure following the brackets applies to all the letters within the brackets. Let us write the graphic formulas on these bases, remembering first that K and Na are one-handed, while Ca is two-handed.

K—O—H (caustic potash)
Na—O—H (caustic soda)
$Ca<\begin{matrix}O—H\\O—H\end{matrix}$ (slaked lime).

AMMONIA, AN IMPORTANT BASE THAT FLIES ABOUT

These bases, or alkalies, are called *fixed*, just as we call certain oils fixed, because they do not give off gases, but stay where they are. There is, however, another very important base, or alkali, which is a gas and flies about, and so is called the *volatile* alkali, just as we call certain oils volatile. This base we already know, for it is ammonia.

And now I hope you will say that here is an exception to what was said as to the way in which bases, or alkalies, are made. For we said that these are compounds of metals, and if you remember the formula of ammonia, you will see that it has no metal in it. Its formula is NH_3. If we add the formula

of water to this, we get NH_4OH, which represents ammonia in water; and this substance is a true base, and acts like one. There is some reason to suppose that the combination of atoms NH_4, acts like a metal, and has something like the properties of a metal. Anyhow, this compound gives an alkaline reaction to litmus paper, and it acts chemically in precisely the same way as the fixed bases, such as KOH, NaOH, $Ca(OH)_2$, and many others which might be named.

You will have noticed the way in which —OH turns up again and again in the formulas of these bases; and indeed, —OH is such a common and important combination of atoms that it has been given the special name of hydroxyl. We find it in chemistry wherever we turn. And I want to show you that these various bases, or alkalies, really owe their —OH to the fact that they are combined with water. Let us start with slaked lime, as that is simple.

WHAT HAPPENS WHEN QUICK-LIME QUENCHES ITS THIRST

There is a compound called quick-lime, which really means *live* lime. It is called live lime because it acts so powerfully on things, as you soon find out if a speck of it gets into your eye. It is a white powder, and its formula is CaO. It is a very powerful base, formed by heating calcium carbonate, or chalk; thus

$$CaCO_3 = CaO + CO_2.$$

Now, when we add water to quick-lime, we are said to slake it, and the product is called slaked lime; thus—

$$CaO + H_2O = Ca(OH)_2.$$

This slaked lime, then, is an oxide which has combined with water, and the same is true of the other bases we have named. For instance, there is an oxide K_2O, the oxide of potassium; and another, Na_2O, the oxide of sodium. When water is added to these — and, indeed, there is no need to add water, for they take it from the air if they are exposed to it— the following reactions occur:

$$K_2O + H_2O = 2KOH$$
$$Na_2O + H_2O = 2NaOH.$$

You will notice that these correspond exactly to what happens when quick-lime is "slaked" —that is, when it has its thirst satisfied—in the water; and when ammonia gas is added to water. So now we understand why these bases have the —OH, or hydroxyl, in them, and we can easily remember that the proper chemical name for them is *hydroxides*.

And now we have to study a third group of compounds, called salts; and the reason why we have kept their study to the last is that *a salt is made when an acid meets an alkali, or base.* In studying the acids we saw that, while every acid contains hydrogen, and no acid contains a metal, yet the hydrogen of an acid—or part of it—can always be replaced by a metal, forming a salt. We shall now see how this happens.

WHEN AN ACID MEETS AN ALKALI OR BASES A SALT IS MADE

Suppose we take some hydrochloric acid, HCl, and let it meet some caustic soda, NaOH. This is a very simple case. At once a powerful reaction happens, and a salt is formed. Here is the equation:

$$HCl + NaOH = NaCl + H_2O.$$

This means that we take an acid and a base, and we get a salt—in this case, the common salt, or sodium chloride, that we know so well. The hydrogen and oxygen of the acid and the base have combined to form water; and we get a solution of salt in water.

Now let us take another instance. Let us add slaked lime to sulphuric acid, and see what happens. We know that lime is a compound of calcium, and that salts formed from sulphuric acid are called sulphates, so we get calcium sulphate, thus:

$$H_2SO_4 + Ca(OH)_2 = CaSO_4 + 2H_2O.$$

SOME FAMILIAR FORMS OF SALT, AND HOW THEY ARE MADE

If you test this rather difficult equation, you will find that it is right. $CaSO_4$ is calcium sulphate, and water is formed as in the last case. But this time the salt is almost insoluble in water, and so we find a white mass of stuff, which is the salt. This salt occurs in nature in great masses of rock called gypsum or alabaster, and is very much prized for its beauty. Another form of it is called plaster of Paris, and occurs as a powder. If water is added to the powder it soon "sets," and so we can use it for making casts, or images, of all sorts of things.

In these instances we see the way in which the hydrogen of an acid can always be replaced by a metal. The method is to bring a base to act upon the acid.

We see, too, that every salt consists

of two parts. It is a sort of double thing, having one part derived from an acid, and one part derived from an alkali, or base. These parts are called *radicles*, which means little roots. Thus the salt $CaSO_4$ consists of a basic radicle and an acid radicle, as we see when we look at it.

How a strong acid will turn a weak acid out of a salt

And now we are to learn that different acids have varying degrees of power, and that a powerful acid will commonly turn out from a salt the acid radicle that goes to make it up, and will replace it by its own acid radicle. The strongest acids are those we began by mentioning—hydrochloric, sulphuric, and nitric acids; and among the weakest are prussic acid and carbonic acid. We call prussic acid weak because its salts can always be decomposed by other acids. Let us take an easy instance. If we act on sodium carbonate with hydrochloric acid, we find that the carbonate is decomposed, and the acid radicle of the stronger acid replaces the acid radicle of the weaker acid, thus:

$$2HCl + Na_2CO_3 = 2NaCl + H_2CO_3.$$

We get sodium chloride again, and true carbonic acid. But instead of H_2CO_3, we might have written $H_2O + CO_2$, for some of the carbon dioxide of the acid is given off to the air. In so doing it forms bubbles, or it *effervesces*, as we say; and we commonly know that we have been acting on a carbonate when we add an acid to a salt and find that bubbles are produced.

This will teach us that one of the easiest ways of making an acid is to take one of its salts and act upon it with a stronger acid, which turns it out and takes its place. For instance, if we want hydriodic acid, HI, we have only to take an iodide, such as KI, and act upon it with hydrochloric acid, thus:

$$KI + HCl = KCl + HI,$$

which tells us that the iodide is decomposed, potassium chloride and hydriodic acid being formed.

The varying strengths of acids and bases

There are certain salts in which only part of the hydrogen of the acid is replaced by a metal. For instance, there is the perfect salt K_2SO_4, potassium sulphate, in which the whole of the hydrogen of sulphuric acid has been replaced by potassium; but there is also the salt $KHSO_4$, in which only one of the hydrogen atoms has been replaced by potassium. We call these acid salts.

Acids and bases vary in their strength. If we have a salt made of a weak acid and a strong base, the salt will be really more basic than acid; and though it should be neutral to litmus paper, we find that it turns red litmus blue, just as if it were a base. Thus, sodium chloride is neutral to litmus paper, for it is composed of a very strong base and a very strong acid, and these balance one another. But if instead of sodium chloride we take sodium carbonate Na_2CO_3 (which we usually call washing soda), we have a salt made of a strong base and a weak acid, and this salt turns red litmus blue. This case also illustrates for us what was said about cases where only half the hydrogen of an acid is replaced by a metal.

How soda illustrates a change always going on in our bodies

Just as we have $KHSO_4$, so we have $NaHCO_3$, and this is usually called sodium bi-carbonate, or baking soda. It is called bi-carbonate because from one point of view it contains twice as much carbonic acid as the carbonate; but that is really only another way of saying that it contains half as much sodium. The way to make it is to add another dose of carbonic acid to the carbonate, thus:

$$Na_2CO_3 + H_2CO_3 = 2NaHCO_3.$$

This reaction is one of the most important in the world, and is constantly happening in our blood as it runs in our tissues, and by this means the carbon dioxide they produce is picked up and carried to the lungs, where the equation works in the opposite direction, CO_2 and H_2O (that is, H_2CO_3) being given off by the lungs, and Na_2CO_3 being re-formed in the blood to do its work again. When a reaction, like this one, may work in both directions, we write it in a special way, thus:

$$Na_2CO_3 + H_2CO_3 \rightleftarrows 2NaHCO_3.$$

The arrows show us that the change may go in either direction, or is *reversible*.

Of all the millions of compounds we have only glanced at a few, but we now know what is meant by the words acid, base (or alkali), and salt, and what are the relations between these three kinds of compounds.

THE NEXT PART OF THIS IS ON PAGE 1887.

HOW THE BIRKENHEAD WENT DOWN

This powerful picture, by Thomas M. Remy, brings before us vividly the scene on board the troopship Birkenhead, when it crashed into a sunken rock in Simon's Bay, South Africa, on a February night in 1852. The soldiers fell in as if on parade, and some were told off to help the sailors to assist the women and children into the boats. Thus 184 were saved, but there was no room for more, and, sooner than risk overcrowding the boats, 454 British soldiers and sailors stood in line and went down with the sinking ship. "Birkenhead" is inscribed on the flags of the regiments who thus met death so courageously.

This picture, illustrating the story on page 1820, is reproduced by permission of Messrs. Graves & Co., the publishers.

THE RACE FROM MARATHON

CONTINUED FROM 1744

"REJOICE, we conquer!" Gasping out these words as joyfully as his parched tongue can utter them, a poor worn-out youth drops lifeless into the arms of those Athenians who have hurried out of their city to learn his tidings. His faint whisper goes from mouth to mouth, and is passed on throughout an anxious city, quickening the pulses of the citizens until they lose themselves in an outburst of thanksgiving and rejoicing.

The story of this victory is one of the most thrilling the world has ever known. It takes us back over 2,000 years to one of the first decisive battles in the world's history. Darius, the Mede, has made himself master of Asia, and, angry at some interference on the part of some little Greek state, he assembles his picked soldiers, summons the various tribes who own his sway, and sails over the Ægean Sea to conquer and enthrall those little Greek states of whose skill in peace and war reports have reached him.

Athens is the first large city in the path of his hitherto unconquered hosts, and the Athenians feel the need of aid from the famous Spartans, whose state lay 120 miles to the south across the Isthmus of Corinth. The army of the Medes and Persians are fast approaching, and their city will soon be invested. How are the Spartans to arrive in time? The rulers of Athens, seated in grave council on the Acropolis, send for Pheidippides, their champion runner, who has won for his state the myrtle crown at the famous Olympic games held by the Greek states every five years. They command him to run and urge Sparta to come to their aid. And for two days and two nights Pheidippides runs, swimming the rivers and climbing the mountains in his path.

But the Spartans were envious and mistrustful of Athens. Though brave and fearless, they lacked intelligence; and, besides, they were a very superstitious people, and so Pheidippides was sent hurrying back with the news that their army would come, but could not start until the full moon.

Pheidippides races back to Athens again. The Athenians were now thrown on their own resources. The Persians had landed and the Athenians resolved to oppose them at once. The weary but dauntless Pheidippides takes his long spear and his heavy shield, and marches with the 10,000 picked men to meet the foe. We read elsewhere of the famous battle of Marathon and how these 10,000 Greeks drove back hundreds of thousands of Medes and Persians; this story is of Pheidippides.

Marathon was fought and won, and the victorious Greeks called to Pheidippides to take the news to the capital. He flung down his shield, and ran like fire the long twenty-six miles to Athens. There he fell and died, gasping as he fell into the arms of his friends the two Greek words which mean, "Rejoice, we conquer!"

THE MEN OF THE BIRKENHEAD

IT was not so very many years ago that the steamer Birkenhead was on her way from England to South Africa. On board of her were the crew and a number of soldiers, besides the wives and children of several of the soldiers; for they were not going out to a war, but to form part of the garrison of the country.

As the great ship steamed along the coast of Africa, no one dreaming of danger—it was night, and all but the sailors who had to work the ship were sleeping—her side crashed against a sunken rock. Everyone hurried on deck, for all knew from the shock that some great disaster had happened. But there was no panic. The officers gave their orders, and the men obeyed them as steadily as if they had been on the parade-ground. The soldiers were set to help the sailors, working at the pumps to keep the ship from sinking, and getting the horses overboard to lighten her. That must have been a sore task for men who loved the poor horses, but they could not be saved. And still the water came in, and everyone knew the Birkenhead must go down.

Then they set about launching the boats. The sea had not been dangerous for the big ship when she was whole, but it was too rough for small boats. One big boat and two small ones were filled with women and children and pushed off safely; another was smashed by a falling spar; and two were swamped before anyone could be got into them. Then the ship herself broke in two, and one half began to sink.

The soldiers were already drawn up in ranks. The captain called to them to swim for the boats; but the colonel saw that if they did the boats would be over-filled and swamped. The men stood firm, awaiting their officer's order. He told them that if they swam for the boats, these would be capsized, and the women and children drowned.

So they stood in their lines, waiting for the ship to go down, as steady as if they were on the drill-ground. Then the hungry waves washed over the decks, and the brave soldiers were plunged into the sea. All they could hope for was to keep afloat till the boats reached the shore and could return to pick them up. A very few managed to swim ashore by themselves. A few held on to the wreck, and these were picked up next morning by a passing vessel which had also rescued the people in the boats who had been unable to reach the shore. But the greater number perished, heroes no less than if they had fallen on the field of battle.

THE SWISS GUARDS WHO DID THEIR DUTY

THE Swiss have often been noted for brave deeds, but one of those we like to think about most was done by Swiss soldiers far away from their own beautiful country, in Paris, in 1792, the year of the Revolution.

The French kings had learned to rely on the Swiss, and had formed a guard of honor of trusty yeomen from Lucerne and other cantons, and called it "Les Gardes du Roi."

When the mob stormed the Tuileries Palace, where the royal family were, on August 10th, 1792, the Swiss Guards stood firm defending King Louis XVI. and his queen, so that the men who were thirsting for their blood could only reach them over the bodies of the Swiss. One after another the soldiers were massacred, fighting bravely till two battalions were overcome, and when the rest fell, on September 2nd and 3rd, the Swiss Guards were almost wiped out.

The great Danish sculptor, Thorwaldsen, designed a beautiful memorial for the Swiss Guards, which has been sculptured out of the natural rock in the Glacier Garden at Lucerne. It represents a wounded lion pierced by a broken weapon, defending with its paw, as it lies dying, a shield bearing the fleur-de-lis of France. On the rock over the lion's head we read "Helvetiorum fidei ac virtuti," a Latin inscription which means "To the fidelity and courage of the Swiss." Then the names are given of those who were not false to the oath of fidelity—officers and men who fell not in defence of their own country, but simply in doing their duty to a foreign king.

If you ever go to Lucerne, be sure to see the lion, for it is a touching monument to loyalty, carved in the Alps of the men's native land. It is over a hundred years since they fell, but their memory is still dear in the land of their birth.

A BRAVE FERRY CAPTAIN

IT was a public holiday, and scores of tired workers, freed for a short time from office and workroom, were crowding the ferry-boats plying in all directions from the great city. For more than a week the heat had been intense, and people had dropped in the streets, where every breath of air seemed cut off by the high buildings. Beneath their feet the pavements were hot, and a subdued glare tired their eyes. Only on the water was the air cool, and there only were sights that could be borne with open eyes.

Soon, however, bent backs straightened, and pale cheeks flushed as a stiffish breeze, carrying a tang of salt, met the boat as she swung outwards into the bay. The passengers who had been almost silent at first began a merry chatter, and a band struck up on the upper deck. Accustomed as he was to his human load, Captain Jenkins felt a thrill of pleasure as the jaded faces grew less tired and gray. He was running on schedule or he would willingly have lengthened the trip for the precious refreshment that it gave.

The distance was only half-covered when a group of passengers called attention to smoke that was rising out of the woodwork surrounding the pilot-house.

The breeze was very strong, and the wood well seasoned and oily, so that the fire gained quickly. It seemed to come from beneath the floor of the hurricane deck and Captain Jenkins quickly ordered some of the crew to chop through the walls of the pilot house and through the floor of the hurricane deck so as to get at the flames with water. In the meantime, the passengers, who numbered more than a hundred, gathered around and looked on with more interest than alarm. The sailors worked with a will and soon some of the woodwork was cut down, and buckets of water thrown on the flames. But it became evident that the fire instead of yielding was beginning to burn more briskly and matters began to look very serious.

The ferry-boat was equipped with a line of hose, and this, at the captain's order was trained on to the fire, and a message down to the engine room ordered a stream of water, pumped from the engines, to be directed upon the burning boards.

When it appeared that the fire was a serious matter, Captain Jenkins, who was at the wheel, turned on the boat's whistle full blast. The call for assistance was not made any too soon, for the flames were spreading in the direction of the wheelhouse. The passengers were as yet not gravely alarmed, but stood around seeming to regard the fire and the sailors' efforts to quell it as a spectacle got up for their benefit.

Captain Jenkins disliked to disturb their indifference, but his duty was clear, and very calmly he ordered the passengers to the stern of the boat, detailing such of the crew as were not fighting the fire to take measures to prevent panic. Then he telephoned the engineer to put on full speed.

One of the city fireboats heard the long drawn out whistle, and, recognizing the note of distress, made for the ferry-boat with all speed. A little tug, waiting for a new convoy and noticing the volume of smoke, steamed bravely to the assistance of the burning craft. The captain was finding it increasingly difficult to steer on account of the scorching heat when the two fire-fighting boats drew alongside. The ferry had now only five minutes run in order to make the landing, but clever steering was necessary to bring her into the slip.

Streams of water from the fireboat and the tug were thrown upon the burning pilot-house. The passengers, some of whom had already been wet by the ferry's hose, were caught under the new streams. Captain Jenkins, who had stood his ground in the face of the fire, and whose face and hands were already badly scorched, calmly stuck to the wheel again with two powerful streams breaking around him, and occasionally even on him.

Both of the fireboats, steering carefully, stayed at the side of the ferry as she moved to her landing. The blaze was not entirely out, but was well under control when at length the boat reached her pier amid the cheering of the many holiday-makers ashore. Then with the assistance of the additional hose it was quickly conquered. In spite of scorched hands and face, the captain personally supervised the safe landing of his passengers.

THE NEXT GOLDEN DEEDS ARE ON PAGE 1953.

THE TREE THAT IS GROWN FOR AN INSECT

The heart-shaped leaves of the mulberry, that do not appear till May, provide good food for silkworms.

Mulberry flowers grow in short, irregular catkins, and are not very attractive, but the fruit is pleasant.

The mulberry is not a native American tree, but has been introduced from the Far East. In the south of France, large plantations of mulberry-trees are grown to provide food for silkworms; and, last century, thousands of trees were planted in Ireland, in order to found a silk industry there, but this was not a success.

These two caterpillars of the silkworm moth, feeding upon mulberry leaves, are shown natural size.

THE WONDER OF A PIECE OF SILK

CONTINUED FROM 1764

IF a boy had money enough, he would like to buy his mother, or his sister, a silk dress for her birthday. Very pleased she would be to have it. But if he said to her: "Here is a caterpillar gown for you," she would be horrified and call him a dreadful boy. Of course, a silk dress is not really a caterpillar dress, for that would mean that the dress was made of caterpillars. But though this is not the case, the material, if it be pure silk, comes entirely from the caterpillar, only we call the caterpillar in question a silkworm. That is merely a way we have. We call the silk-yielding caterpillar a silkworm, and we call the light-giving beetle of this country a fire-fly. Many things go by wrong names in common speech, and the result is that, when we study natural history, we are surprized to discover the true nature of the things we have so long misnamed.

SILK MOTH

The material of the silk dresses that our mothers and sisters are fortunate enough to have is made by a very ordinary-looking, big, fat caterpillar, and boys who keep caterpillars of this sort may, if they like, become silk merchants on a small scale. The silkworm is as much dependent upon man as is the canary in its cage. If all the tame silkworms in captivity were turned loose, the bulk of them would die. They depend upon us for their living, and we depend upon them for our silk. We can make lovely scents and sweets from coal-tar; we can make all sorts of things in the laboratory of the chemist, but not all the wisdom of man can make a piece of silk. How came man, then, to have these wonderful insects to work for him, and how came they to depend upon man for their safety? It is a wonderful story and takes us back to thousands of years before Jesus was born.

It was those wonderful people, the Chinese, who first discovered the use of silk. They learned that it could be woven into material for dresses, and they learned how to get it from the silkworm. They found that the caterpillar or the silkworm could be kept alive in captivity; that it would thrive as a prisoner, if it were kept clean, and fed on mulberry leaves, quite as well as if it were at liberty. So they kept the caterpillars, and when these turned into moths, they kept the eggs that they laid, and when the caterpillars spun cocoons of silk in which to live, they took a certain number of the cocoons and unwound the silk of which they were composed, and made the silk into dresses. What the Chinese were doing with caterpillars, nearly five thousand years ago, the people

in many countries are doing to-day, and all for the same purpose, that men and women may have silk to wear or to use for the thousand and one purposes for which this beautiful fabric is so much sought. Let us see what this wonderful process of Nature is that gives the world its silk.

FORTY THOUSAND EGGS THAT WEIGH ONLY AN OUNCE

We will suppose that we are setting up for ourselves as keepers of silkworms. The eggs—the only things that we need—can be bought, and we can set to work to gather silk this very summer. It is better fun even than keeping ants, for here we can see all that happens in the process. With how many eggs shall we start? A pound? No, nor an ounce. They are so light that there are about 40,000 eggs of the silk moth to the ounce, or about 100 to a grain. Of course, we must have a proper place in which to keep the eggs, a place in which we can be sure that the temperature will not fall below 62 degrees, nor rise higher than about 80 degrees. The heat may be increased as the time for hatching draws near, but it must never be more than 80 degrees. As a matter of fact, the lower the temperature, so long as it is not lower than 62 degrees, the stronger and better the caterpillars will be.

For this reason we must have a place where we can have a little artificial heat. A conservatory is a good place, but we must talk politely to the man who stokes the furnace, or he may let the fire get too hot or fall too low, and so spoil our chance. Of course, thousands of poor people have bred silkworms who could never afford a greenhouse. How did they manage? Many of them have put the eggs carefully in a bag and carried the bag tied round their necks so that the warmth of their bodies might hatch the eggs.

WHEN AND HOW TO HATCH THE SILKWORM'S EGGS

With ordinary care there is no difficulty about hatching the eggs. But we must be ready for the day when they do hatch. First of all, we must be sure to have a supply of leaves of the mulberry-tree ready. It is of no use our hatching the eggs if this tree is not in leaf. The caterpillars would eat lettuce, but they would not be nearly so fine, nor would their silk be worth much, after a diet of this sort. The next thing is to see that we have ready a very thin card, or piece of paper, pierced by little holes, which may rest on a ledge in the box, over the eggs. The little caterpillars, as soon as they are hatched, will see the light through these holes, and will crawl towards the light through them. In doing so, they will scrape off the shells clinging to them, and so escape all risk of being killed by being unable to free themselves from the shells. The caterpillar of other moths, as soon as he is born, makes a meal of his shell, but the silkworm needs this little help.

Now comes the first enjoyment of silkworm rearing. We can have a great many in a single big cardboard box, but we must be careful that this does not become crowded, or there will be trouble when the time for cocoon spinning comes. Better have three or four big boxes, like those in which the tailor sends home our suits of clothes, than that the silkworms should suffer for lack of sufficient space. It is a great convenience that we may safely leave the box open. We could not do this with any other caterpillars, for they would escape.

THE LITTLE SILKWORMS THAT WILL EAT A FOREST OF LEAVES

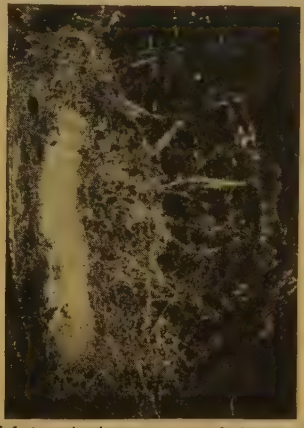
Not so the silkworm. It is as happy as can be in a box without a lid, provided that it has plenty of food, and that the box is perfectly clean. Keep down the heat to as near 62 degrees as possible, and the silkworms will grow big and strong. They eat a surprizing quantity of mulberry leaves.

We are not going to have a whole ounce of eggs, with 40,000 silkworms hatching out; but, in order that we may get an idea of the appetites of these insects, we will suppose for a moment that we *have* got this number. During the eight weeks that they live in the caterpillar stage, the 40,000 silkworms will require over 1500 pounds of mulberry leaves. Of this quantity, some will be wasted, for we take out all dry and stale leaves. But there remain perhaps 1000 pounds to account for. That amount the caterpillars actually eat. We have to exercize care in the feeding, to distribute the food evenly, so that the caterpillars shall not have to struggle and fight for their meal. A good way

THE SILKWORM AND ITS GLOSSY CRADLE

The silkworm's eggs, here much magnified, are first bright yellow, and then become greenish grey.

Some young silkworms feeding upon mulberry leaves, their principal food. They eat lettuce leaves also.



Having found a suitable place in which to spin its cocoon, or being provided by the silk farmer with a paper cone for this purpose, the worm spins its silken bed. These pictures show three stages of the work.

In this picture we see a completed cocoon resting among the twigs where it has been spun by the worm.

Above is a completed cocoon, and below is one with the outside silk removed to show the inner silk.

is to cut up the leaves small, as this makes the distributing easier. The pace at which the caterpillars grow is surprizing. Like other caterpillars they have to moult — that is, to cast their skin. The skin in which they are born does not last all their lives.

How the little silkworm changes its skin and grows big

When they are about six days old, they cease to feed. The skin splits down the back and the caterpillar crawls wearily forth, bearing his new skin about him. His appetite returns, and he eats more heartily than ever. He grows rapidly when the new skin is still soft. But, after a few more days, another new skin is required, and after that a third, and finally the fourth.

Each moulting time is a period of serious trial for the silkworms, and many die during its progress. Once the last moult is over, however, the caterpillar eats away as if it knew that its days for feeding were numbered. By this time it has become one of the biggest of all our caterpillars. Whereas it was at birth only a speck, weighing the hundredth part of a grain, it has now increased its weight to about 95 grains, and its length to three inches or thereabouts, which is a very rapid growth for two months. Now comes the most important time of the caterpillar's life. It has to become a chrysalis, and it is in order that it may safely pass through the chrysalis stage that it spins the famous silk.

All the time that the silkworm has been growing up, it has been forming and filling two large vessels, or sacs, that run along the sides of its body. In these two sacs is stored a sticky fluid. If we saw it in its natural state — that is to say, the state in which it is while still in the body of the caterpillar — we should not have the least idea as to what it was.

The sticky stream that becomes a strand of glossy silk

That sticky stuff in the body of the caterpillar is to become the marvelous silk which makes the insect so valuable. When it is about to spin, as we call it, the caterpillar ceases to eat anything. As we watch, we see a tiny stream issue from its lower lip. That is the silk issuing from the spinnerets, or seripositors. It is as well that we should know the names, so that we may not have to puzzle when we meet them elsewhere. We must remember, too, the scientific name of the silkworm. It is the *Bombyx mori*. Well, then, the *Bombyx mori* begins to spin its cocoon by producing a tiny stream of silk from its spinneret, or seripositor. The sticky fluid, if we force it from the body of the silkworm, becomes hard at once; but, manipulated by the silkworm, it is drawn out into a beautifully fine strand of silk. Strands from two sacs are joined together by the silkworm to form one thread, and it is only by the aid of the miscroscope that we are able to discover that there are two in the thread. With this material, the silkworm weaves itself the loveliest house of silk.

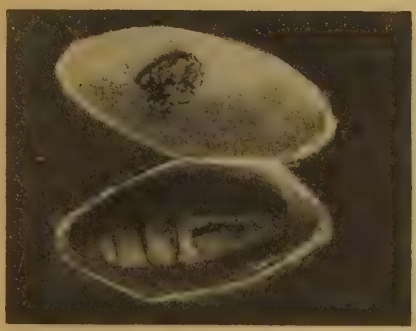
The work usually takes three days, but may take four, or even five. Little by little, the silkworm builds up its castle, weaving it so perfectly that at last the worm is entirely shut in and quite invisible. All the time that it is building, the silkworm works its head round and round in a regular order, never wearying. And all the time the silk never fails.

A dainty globe of silk that looks like a fairy egg

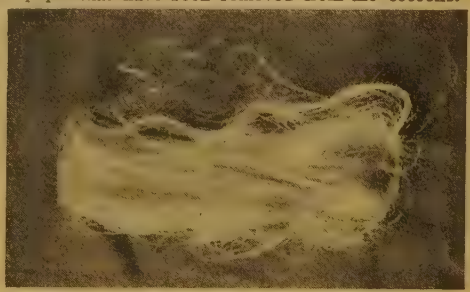
The silkworm, at the beginning of the task, weighs over 90 grains. When the labour is ended, the silkworm, with its cocoon, weighs only about 50 grains. And there it is in a lovely globe of tightly woven silk, looking like some fairy pigeon's egg. The cocoon may be either white or pale yellow. Having watched the spinning, we realize why we ought to be careful that the silkworms have plenty of space. If they are at all cramped, two will spin together only one cocoon, and this will be useless.

If we leave the cocoons alone, there will come forth, in about fifteen days or three weeks, a pretty moth from each. The average length of the moths is about half an inch, but the males are slightly smaller than the females. They can be kept on a cloth. They eat very little, and sometimes even nothing at all. They mate as birds mate. The females lay 500 or more eggs, and then die, and the males do not live long after them. Their whole lives as moths last but a few days. In that time, they never try to fly away. The females cannot fly at all; the males have just enough power in their wings to steady themselves in descending but they cannot possibly fly upwards.

HOW THE SILKWORM GIVES ITS SILK



Having spun its cocoon, the silkworm, which is not really a worm at all, but the caterpillar of a moth, changes into a chrysalis, or pupa. On the left we see a cocoon cut open, showing the pupa, and the old skin of the caterpillar, and on the right is a number of pupæ that have been removed from the cocoons.



The picture on the left shows some cocoons with the coarse outside silk, known as floss silk, removed. These cocoons are now ready to have their silk wound off into skeins, and we see a completed skein on the right.

The silk is wound into skeins by a very simple winder. The cocoon is placed in a vessel containing warm water, A, and the strands of silk, B, are wound round the drum, D, turned by the handle, C.

The photographs on these pages are by Henry Irving and Percy Collins.

In this, we see the result of thousands of years of care and attention on the part of man. The *Bombyx mori* has always been the one species common everywhere as man's silk producer. Certainly, there are others in captivity in China and Japan, but they are not of much importance. At any rate, in America we have never been able to do much with them. There are wild silkworms, too, but their silk is of little use to men, so there has been no attempt to cultivate them. Those that have been allowed to remain wild can fly about as well as any other moths. Only those that have been cared for by man have given up the power to fly. If they could fly, they would fly away, and we should never know where to look for their silk.

So far, we have traced the silkworm from the egg to the caterpillar, and from the caterpillar to the moth. What of the silk, of which we have talked so much? Here we come face to face with a little tragedy. For every silk dress that is made means the death of thousands of silkworms.

WHY THE SILKWORM MUST DIE IN ORDER TO GIVE US SILK

That sounds dreadful, but it is not so in reality. The life of the silkworm, as a silkworm, is ended when the insect has reached the chrysalis stage. It is then in a state of torpor, and can have no sense of feeling, unless time and care are given to rousing its sleeping energies to a sort of wakefulness. That is not done. When the cocoons are all ready, we have to decide how many moths we want to renew our supplies of eggs. We take away those for the nursery. The others we want for silk.

These we plunge into scalding water. Manufacturers steam them, or submit them to a high dry heat. This kills the chrysalis. The reason why this has to be done is, that if life remained in the chrysalis, the latter would turn into a moth, and would then form an opening at one end of the cocoon out of which to creep, so spoiling the cocoon.

The next step is to wind the silk on to reels. To do this, the cocoon has first to be softened in water which is warm but not hot. The water dissolves the gum that binds the silk together. A neat-handed girl then twirls the cocoons about with a light brush, that catches the loose ends and causes them gradually to unwind. All that we have to do is to undo the work that the caterpillar did. But the silk is far too fine to be wound in this state. In the thinnest part the silk is so fine that 2000 strands of it, laid side by side, may cover only an inch, while, in the thickest part, from 600 to 700 strands would be required to make up an inch in thickness.

SOMETHING THAT THE WISEST MAN CAN DO NO BETTER THAN A BOY

So, when the ends of the silk are discovered, the operator joins four or five together, passes them through a fine eye of glass, or polished metal, in a winding machine, and, letting the cocoons remain in the water, winds away until all the silk that can be used is wound out from each cocoon. The silk is wound on to a big wheel, and care has to be taken to see that the strands do not stick together. In Eastern lands, and in some parts of Europe, machinery so simple that a boy could make it is used; but in big factories they have much improved on this. Still, the principle is everywhere the same, and at this stage the wisest man in the world could do no better than any ordinary boy or girl who has had a little experience with the winding.

Once the silk is freed from the cocoon and wound on to wheels, or whatever they may be, it is ready for the manufacturer. Many processes follow. The silk has to be freed from all the gum remaining on it, for at present it has no lustre such as we expect silk to show. It has to be cleansed by boiling, to be scoured, and purified by acids. That is one way. Another is to let the silk begin its own purification by a process of fermentation, which is done by shutting up the uncleaned silk in tanks containing soapy water, in which it may lie for weeks. Then follow all sorts of washings, and finally a drying.

HOW THE TANGLED SILK IS COMBED STRAIGHT BY A WONDERFUL MACHINE

Then we have the silk clean, but terribly entangled. Wonderful machinery combs out the tangle, and makes all the strands of silk straight, and smooth, and even. Finally, the silk is ready to be made up into dress materials, or into whatever may be required, just as if it were wool or cotton. A garment of pure silk lasts a very long time, for there are very few things that wear better. Unfortunately,

manufacturers have discovered a way of adulterating it while the cleaning process is being carried out. They add salts of metals that are absorbed by the silk. This adds weight to the silk, and makes it appear a fine heavy fabric. But silk made by such dishonest methods soon rots. It is this adulteration that makes silk "cut" so readily, and makes a silk garment, or silk umbrella, become full of slits even when it is not much used.

How some eggs gave Europe silk for hundreds of years

It is very wonderful to think that all the millions of silkworms that for many years produced the silk upon which England and the whole of Europe mainly depended came from the batch of eggs brought by two monks from China. This is the story. The art of making silk began, as we have seen, in China. The Chinese guarded their secret as closely as they could. They thought it good that their people should know how to make silk, but they did not want people in other countries to know how to do it. If other people wanted silk, they must buy it of the Chinese, not make it for themselves. They sold a good deal to Rome, for Rome in all her glory could not produce silk for herself. This state of things lasted until 550 years after the birth of Christ. Then the wise emperor, Justinian, who ruled in Constantinople, saw how important was the silk trade, and determined that he would create a trade in silk for the Roman Empire.

Two Persian monks, who had long lived in China, told him that they had seen the whole process of rearing the silkworms, and the manner of treating the silk. So he sent them secretly to China to get him some eggs of the silk moth. They walked all the way from Constantinople to China, and they walked back again, but they brought with them some of the precious eggs.

The silkworm's eggs that came to Europe in a bamboo stick

It would have cost them their lives had the purpose of their visit been known. They knew this, and were very careful. They got a supply of eggs of the silk moth, hid them in a hollow bamboo, and then carried them to Constantinople and presented them to the Roman emperor, who ruled in what is now the capital of Turkey. The emperor was delighted. The eggs were hatched, and there appeared, for the first time in history, a number of silkworms in Europe. From each female moth he would get 500 or more silkworms, and from these in turn there would be another great increase. The monks had brought him, in the little bamboo nest of eggs, the richest gold-mine that they could have given him.

The emperor caused a silk factory to be set up in his royal palace. Only those whom he appointed were allowed to manufacture silk. But, in course of time, the eggs of the silk moths were carried to other countries. In Italy and France many towns became famous for their silk manufactures. Frenchmen, persecuted on account of their religion, fled to England, and took with them the secret of manufacturing silk, and after a while silk fabrics began to be made in England, where an important industry quickly grew up. They tried hard to cultivate silkworms in England and in Germany, but never succeeded sufficiently to supply the factories with cocoons. It has been tried also in our own Southern States, where great numbers of mulberry trees have been planted of the kind cultivated in southern France and Italy, which were originally brought from the Far East; but it has failed here too. Our extensive American manufactories of silk dress-goods, ribbons, etc., therefore have to depend, as do those in England, on raw silk imported from Europe, or from China and Japan.

About the year 1850 a terrible disease broke out among the silkworms of Italy and France. In spite of the disease, there were always some healthy caterpillars producing silk, and the trade never came to a standstill; but the damage done to that part of the trade which failed robbed France and Italy of hundreds of millions of dollars.

It was only then that Europe had to send again to the East for more eggs of the silk moth. For hundreds of years Europe had been stocked with its millions of silkworms from the descendants of those silkworms which came from the eggs carried away in a little bamboo by the two monks at the command of Emperor Justinian.

THE NEXT STORY OF NATURE IS ON PAGE 1893.

CROSSING THE SIERRA NEVADA

Though the Western mountains were high and rough, occasionally a low place called a gap or pass was found over which a crossing could be made, though often with great difficulty. Here we see wagons crossing the Sierra Nevada Mountains, or rather going around the edge of them. Notice the straining oxen, and the men pushing with all their might to gain the top. Beyond we see a wagon train descending.

1830

THE HISTORY OF THE UNITED STATES

IN this section we return to the story of our country. After the Constitution was adopted new states began to ask for admission to the Union. In this volume we trace the growth of our country in territory, population and wealth. You will find that the west of which we speak, has always been the country which lies beyond, and has meant different things at different times in our history. We tell how we secured Florida and the Oregon country, and how, after a short war, we gained from Mexico a great extent of land in the Southwest, including California, and thus extended our territory to the Pacific. We tell also of the rise of the Mormon power and of the discovery of gold in California, which drew people there like a fire-alarm, and of the dangers and difficulties which met those traveling across the plains in wagons or on foot, before the days of railroads. The conquest of the West is a stirring story—more thrilling than any drama.

THE GROWING WEST

CONTINUED FROM 1692

THE West has meant quite different things at different times in our country's history. The region along the Connecticut River was the West to the founders of Plymouth and of Boston. The country around Pittsburgh was once the far West. Then Tennessee, Kentucky, Mississippi and Ohio became the West as population advanced. Next the country across the Mississippi was called the West, and not until later were the Rocky Mountains crossed.

All this means that the West has been the unsettled part of the country, where wild beasts and Indians were to be fought by the settlers as they moved on. Now farms and villages are seen in almost every part of the country and great cities have grown up, and are growing up, in every part of the Union. Soon the West will mean something entirely different. The buffalo has disappeared, the wolf, the bear, and the mountain lion are going, and in a few years there will be no more large tracts of land without inhabitants.

WHY THE EARLY SETTLERS MOVED WEST

In the early colonial days the land near the seashore was first taken. As more people came over they sometimes went further into the land, and sometimes bought the farms of the first settlers, who themselves moved. At the time of the Revolution, only a narrow strip along the Atlantic, one hundred to three hundred miles wide, had been really settled, but already a few restless men had crossed over the Alleghany Mountains into the Mississippi Valley. If you will turn back to the map in the first volume you can see what that meant. From the northern part of New York state down to Georgia, the mountains stood like a wall to keep back the travelers.

But in spite of these mountains, the restless colonists made their way into the fertile river valleys beyond, and then moved on across the prairies. The Constitution gave Congress power to make new states whenever the population of a district or territory was thought to be large enough, and we shall see that new states have been made until there are now many more than the original thirteen. Let us see how and when some of these new states were admitted into the Union.

THE FIRST NEW STATE ADDED TO THE UNION

The first new state was not admitted in quite the same way as those that were made a little later. When Champlain, of whom you read in another place, came down from Canada to the lake which now bears his name, he looked at the beautiful mountains to the east and said, "Voilà les verts monts!" "Behold the green moun-

Copyright, 1910, 1918, by M. Perry Mills.

tains!" So you see that Champlain named both the lake and the state, and the name of the state translated into English is Green Mountains.

This territory was claimed both by New Hampshire and New York, and both colonies sold the land to settlers, but New Hampshire sold more. When the King of England finally decided that New York had the better claim, the settlers, in 1777, declared that they would not submit to New York, but would make an independent state, to be called either New Connecticut or Vermont. This was during the Revolution, and New York could not enforce its claim. During the Revolution Ethan Allen, Seth Warner and others were active against the British. It was Ethan Allen, at the head of a band calling themselves "Green Mountain Boys," who captured Fort Ticonderoga, May 10, 1775, and gained military supplies much needed by the colonists.

After the Revolution the Vermonters tried to get the Congress to acknowledge them as independent. Congress did not wish to offend New York, and it was not until after the Constitution had been adopted that the new government listened to them. In 1790, New York agreed to give up all her claims on payment of $30,000 and on March 4, 1791, Vermont took her place as the fourteenth state.

The Scotch-Irish and Germans come to Pennsylvania

Now let us turn to another part of the country. As we told you in another volume, not all the settlers in the colonies were English, though most of them came from the British Isles. Many came from the North of Ireland, and were sometimes called Scotch-Irish because the ancestors of many of them had gone from Scotland to Ireland. Many Germans also came. These people generally landed in Philadelphia, and went to Western Pennsylvania. So many came because of the wise laws made by Penn that the later comers found the best lands taken. Many of them moved southward into Virginia and the Carolinas.

Daniel Boone was born in Pennsylvania, but while still a boy, his family moved southward to the banks of the Yadkin River, in North Carolina. Boone grew up to be a mighty hunter, married, and built a cabin on the bank of the river. Recently some patriotic people have rebuilt the cabin and furnished it exactly as it was in Boone's time, in order that the children of to-day can see how their ancestors lived. But Boone did not like farming. He liked much better to go on long hunting trips, sometimes lasting for days, or even weeks, during which he could kill deer, bears, panthers, squirrels and wild turkeys.

Daniel Boone and others explore Kentucky

Boone heard from a white man, named John Finley, of a wonderful region over the western mountains which was a hunter's paradise. In 1769, Boone with five others crossed over into the country, which was sometimes called by the Indians the "dark and bloody ground," because different tribes of Indians had fought many battles there. It seems that few Indians lived there all the time, but many came to hunt. For six months the hunters wandered through the valleys and over the hills, sleeping under the stars or in caves. The other men returned to North Carolina, but Boone was joined by his brother and the two remained all winter in a little log cabin they had built. In the spring his brother returned to the settlements to get more ammunition and supplies and to guide any other hunters who might wish to come.

For three months Boone remained alone, two hundred miles from a white man, without a horse or a dog. Other hunters came, but in 1771 all returned to their homes in the East. But the story of what had been found beyond the mountains had spread all over Virginia and North Carolina, and many men wished to try their fortunes in the new land. Many things hindered them but, in 1774 and 1775, settlements were founded which were so strong that the Indians could not break them up, and after the Revolution settlers came rapidly. The territory was considered a part of Virginia until 1790, and on June 1, 1792, became the state of Kentucky, the fifteenth star on the flag.

Settlers cross the mountains into Tennessee

James Robertson was one of the men who went with Daniel Boone to Kentucky on one of his trips, but he liked the country on the banks of the Watauga River in what is now Tennessee better than that further west. He therefore led a party of North Carolina settlers there in 1770, but a few white men had

ETHAN ALLEN AND GENERAL HARRISON

You read in the text of the "Green Mountain Boys." Perhaps their most famous achievement was the capture of Fort Ticonderoga from the British, May 10, 1775, before the Revolution had really begun. Led by Ethan Allen, they surprised the post, arousing the commander from bed, and took it without the loss of a man. The military supplies captured were much needed, and were useful at Boston.

Tecumseh, or Tecumthe, as the name is sometimes spelled, was one of the most dreaded Indian chiefs. He was opposed by William Henry Harrison, then governor of Indiana Territory. In order to drive back the Americans, Tecumthe aided the British during the War of 1812, but was killed October 5, 1813, at the battle of the Thames. Some think he was the greatest Indian who ever opposed the Americans.

already built cabins in the region. They had to meet the same kind of hardships as the Kentucky settlers mentioned above, but brave men joined them. They made a sort of agreement known as the Watauga Association, but soon they were organized as Washington District and then as Washington County, North Carolina, as that state claimed the land to the Mississippi River. These settlers were brave and daring. A weak man had no place among them. When they heard that Major Ferguson was in North Carolina on the way to lay waste their territory, they hurried over the mountains to meet him. Joining other bands from Virginia, and North and South Carolina, they surrounded him at King's Mountain, as you may read in the story of the Revolution, and captured his force. Then they returned to their homes.

THE WESTERNERS ATTEMPT TO SET UP A STATE

As Congress had no money to pay its debts, at the close of the Revolution, it asked all the states holding western lands to give them to the general government. North Carolina agreed in 1784, but the settlers in the West did not like being transferred without their consent, and set up a new state for themselves, which was called the State of Franklin. As money was scarce they fixed the salaries of their officers at so many beaver and raccoon skins, and taxes could be paid in skins or produce.

When North Carolina heard of this, the act making the gift of the territory to Congress was at once repealed and the state began to try to regain control of the rebellious people. For a while the people held out, but they were not encouraged by Congress and soon the State of Franklin was no longer in existence. Again, in 1790, North Carolina surrendered the territory to the new government under the Constitution, and June 1, 1796, Tennessee was admitted to the Union as the sixteenth state.

The great body of land north of the Ohio River from which the states of Ohio, Indiana, Illinois, Michigan and Wisconsin have been made was claimed by Virginia under her charter. Parts were also claimed by Massachusetts and Connecticut. All these states claimed the land under their charters which had been given before anything was really known about America. New York also claimed some of it. All of these states finally gave to Congress their claims in this Northwest Territory, as it was called. Congress decided to sell these lands at a very low price in order to get money to pay the debts of the Confederation.

THE NORTHWEST TERRITORY ALSO GAINS SETTLERS

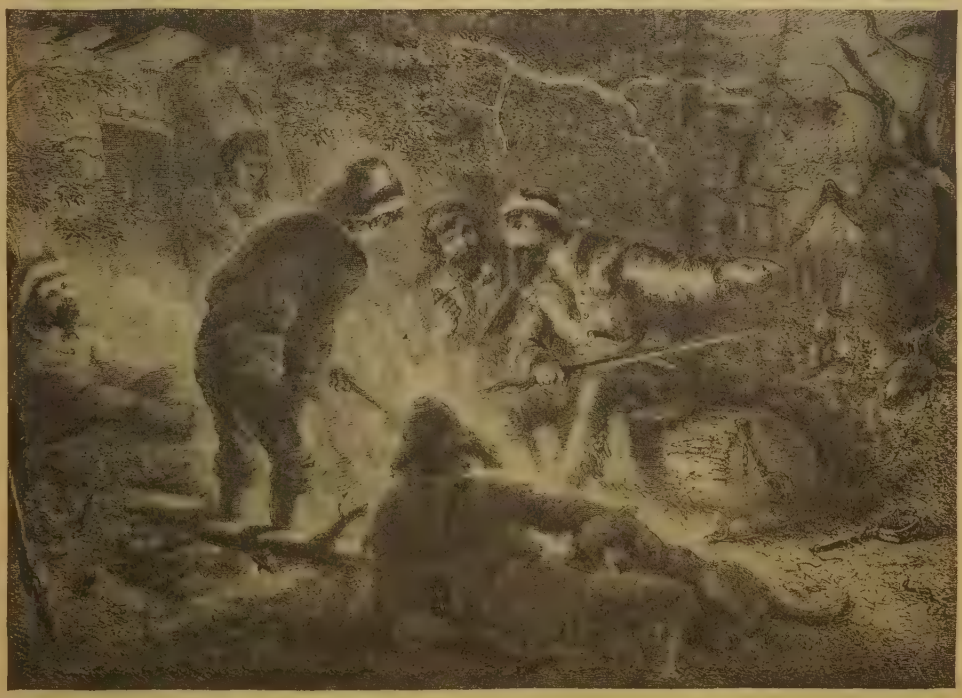
A company in which there were many Revolutionary soldiers, was formed to buy lands in this territory and settle a colony. In 1787 Congress passed an act selling five million acres of land and also making laws for the government of the territory. It was provided that not less than three nor more than five states should be made as the population increased and that when any territory had 60,000 people it should be admitted into the Union. Slavery was never to be allowed.

At once people began to move into the territory. Many of them made their way to the Ohio River, built great flatboats, a picture of which we show you, and floated down. Early in 1788 Marietta, named in honor of Queen Marie Antoinette of France, was begun. This was the first settlement in what is now the state of Ohio. A few months later, Cincinnati (first called Losantiville) was begun.

The companies advertised for settlers, saying that they had the richest and most beautiful country in the world. The land was the richest, the climate the best, and life was easiest in the Ohio country. Settlers came by the thousand, and the older states were alarmed. It seemed as if all their strongest young men were moving westward. So pamphlets were written in opposition, saying that the soil was not good, that the climate was cold, that the woods were full of Indians, panthers and terrible snakes, and that any man was a fool who would leave a comfortable home in the East and risk such dangers as he would meet in the West.

Part of both stories was true. Some of the land was good and some was bad. There were Indians and they troubled the settlers, and destroyed some small settlements. For a while the rush toward this part of the West was checked, but a few years later it began again and in 1803 (February 19th) Ohio was admitted as a state. Other states were soon to be made from the Northwest Territory.

LIFE IN THE WOODS AND ON THE RIVER



Here is a band of hunters and trappers in the wilderness with their rude hut in the background. Around the camp-fire they told the story of what had happened during the day. Perhaps the man on the log is telling how he killed the deer. They kept their rifles near for fear of Indians or wild beasts. Many men loved the life in the woods so much that they could not live comfortably after settlers came.

When the West meant the country across the Alleghanies, a common way of going was to build or buy a flatboat, load upon it all the household goods and live stock, and then float down the Ohio River. This type of boat was called a "broadhorn" because of the two steering oars you see in the picture.

DISPUTES WITH SPAIN IN THE SOUTH CAUSE TROUBLE

Now we have told of the territory in the North and in the middle of the country. What of that in the South? You remember that Great Britain kept Florida, which it had taken from Spain at the end of the French and Indian War. Twenty years later, in 1783, it was returned to Spain. The country then called Florida was divided into two parts. East Florida was almost the same as the present state, while West Florida stretched along the Gulf of Mexico to Louisiana, which was also owned by Spain. Georgia claimed all the territory westward to the Mississippi, but Congress said that it had been a part of West Florida and had been given up by Great Britain, and that Georgia had no rights at all. Settlers moved into the country in spite of the attempts of the Indians to prevent them, and, in 1798, Congress set up the territory of Mississippi.

HARDSHIPS OF LIFE IN THE WESTERN COUNTRY

But after the settlers built their homes in these western forests, they found that all was not easy. It is true that game was plentiful, and that corn and wheat grew rapidly, so that it was easy to get food enough. Flax grew well and rough linen was manufactured by the women, and, since skins were plentiful, all could have clothes. They could not, however, make everything they needed, and they could get these things, which they could not produce themselves, only by trading their skins and furs or what they had grown on their farms. They could not very easily climb the mountains and take these things back to the old states. What could they do?

The easiest thing was to put them on a flatboat and float down the Mississippi with them. But Spain owned the land on both sides of the mouth of the Mississippi, and Spain was unfriendly to the United States. So every boat load that went to New Orleans was either captured or was forced to pay high duties. The United States was not strong enough to force Spain to allow the boats to pass freely and to trade with New Orleans or Mexico, and the Western people grew angry. Some wished to fight and capture New Orleans. Others said that the western people ought to declare themselves independent of the United States and make a treaty with Spain. A few even wished their country to become a province of Spain.

THE EASTERN STATES TRY TO PREVENT THEIR PEOPLE MOVING WEST

All this trouble with Spain about the Mississippi was ended when that nation gave up Louisiana to France. You read on another page how we purchased it in 1803 and you were told how much the New England states opposed buying it. Soon a part of the territory asked to be made a state. There was great excitement in the East when this was first talked about, and much opposition. The eastern states had seen a large part of their population go to the cheap lands in the West. Some men said that unless Congress stopped making new states, the whole East would be deserted and ruined.

They also said that the Constitution did not give Congress power to make new states from any land which was not a part of the country when the Constitution was adopted. This was a new question and was very important, as less than half of the territory of the United States to-day was a part of the country in 1789. Some New England men threatened to secede. But in spite of their threats Louisiana became the eighteenth state in 1812, just before the second war with Great Britain began. Now there were seventeen states east of the Mississippi and one west of the great river.

We have already told of the War of 1812, and shall not say more about it now. After the war there was another great movement towards the West and Indiana was admitted into the Union in 1816; Mississippi came next in 1817, and these were shortly followed by Illinois in 1818, and Alabama in 1819. Many immigrants to the United States soon began to come, and it was not long until England was much troubled to find so many of her citizens coming to the United States.

WE GET RID OF SPAIN BY BUYING THE FLORIDAS

The same year that Alabama came into the Union, Spain sold all her rights in Florida for $5,000,000. Another trouble was ended. Spain had not governed the country well and bands of robbers, white, black and red, had done much damage to the people of Georgia and Alabama. The United States now was beginning to stretch across the continent. It con-

trolled all the land east of the Mississippi and south of Canada, and nearly as much beyond. There were now twenty-two states, and only four more have been made from the territory east of the great river. We shall learn of them soon.

You remember that James Madison was president while the War of 1812 was going on, and for several years afterward. When his two terms were over, another Virginian, James Monroe, became president, in 1817, and he also served two terms. A number of important things happened during these years. The most important for us to mention in our story of the West is what was called the Missouri Compromise. In order to understand it we must go back a little.

Before the Revolution all the colonies held slaves, both negro and Indian. It was soon found that the Indians were not reliable or industrious and so they were no longer held in slavery. It was also found that the negro slaves were not profitable in the North. The climate and the soil did not suit them very well, and so, about the time of the Revolution, the people there began to set them free, or else to sell them to the South.

FOR A TIME SLAVERY SEEMED TO BE DYING OUT

Some of the southern states did not find slavery profitable and at the time the Constitution was adopted, most people believed that the number of slaves would grow smaller and smaller, except in South Carolina and Georgia, where it was thought to be too hot for a white man to work in the rice fields. It was thought that perhaps a few would be kept for house servants, and that the others would gradually be set free.

A LITTLE INVENTION CHANGES THE HISTORY OF THE WORLD

All this was changed by an invention which has changed the whole history of the United States and of the world. At that time the summer clothing of the common people was chiefly coarse linen, while the wealthier wore finer linen or silk. Cotton cloth was very expensive. A small patch of cotton was grown upon almost every southern farm, but the great difficulty was to separate the fibre from the seeds. It was then done by hand, and we are told that it was the task of the slaves, and sometimes of the children of a family, to separate a shoeful of the cotton between supper and bedtime. A whole day's work was only about four pounds. The process was so slow that little cotton was used at home and still less could be sold.

After the Revolution, Georgia presented a large tract of land to General Nathanael Green on which he lived until his death in 1786. In 1792, Mrs. Greene was returning to her plantation, after a visit to relatives in New England, when she met on the boat a young man named Eli Whitney, who had just graduated at Yale College, and was on his way south to teach. When he reached Savannah, he found that the position, which he had expected, was no longer open and accepted Mrs. Greene's invitation to spend some time on her plantation, while looking for another opportunity.

One day a number of gentlemen dined with Mrs. Greene and discussed the need of a better way of separating the cotton. Young Whitney had shown skill in mending clocks and such things, and Mrs. Greene told the gentlemen that she believed Mr. Whitney could make a machine. Though he knew nothing about cotton, he at once set to work and early in 1793 produced a cotton gin which could do the work of a hundred slaves. Hundreds of others were built and cotton soon became cheaper than linen, and the demand increased very rapidly. Another man, Hogden Holmes, about the same time also invented a machine.

SLAVERY AT ONCE BEGINS TO GROW AGAIN

More and more land was planted in cotton, and more and more laborers were needed. Slavery had been dying out because there was not enough work that slaves could do, which paid the owners. The great increase in the cotton fields made it profitable to own slaves wherever cotton could be grown, and many more were brought from Africa. The southern states up to this time had grown many different kinds of crops and some of them had many small factories of different kinds. Afterward they grew more cotton than any other crop, and many of the little factories died out. In New England, where cotton could not be grown, factories to make goods to sell in the South increased in number and size.

After slavery had died out in the North, many people grew to believe that it was wrong to keep slaves, and wished to prevent any new states from having

them. The question came up in 1818 when Missouri asked to enter the Union as a slave state. Many people objected and the House of Representatives, in 1819, refused to agree to admit the new state, though the Senate was in favor of admission. Maine was now also asking admission as a free state. The House agreed, but the Senate refused to consent unless Missouri was admitted as a slave state. Finally it was agreed that both should be admitted, but that, in the future, slavery should not be allowed in any part of the Louisiana Purchase north of 36° 30′, which was the southern boundary of Missouri. This is called the Missouri Compromise.

WHAT DID THE MISSOURI COMPROMISE MEAN?

A compromise is an agreement by which both parties agree to take less than they ask for, for the sake of peace. This compromise was not a good bargain for the slaveholding states. Missouri was added to the Union as a slave state, but the only part of the Louisiana purchase south of the line, from which other slave states could be made, was what is now Arkansas and Oklahoma, while north of the line was the immense territory from which nine have been entirely or partly made. But the compromise brought peace for a while. Maine was admitted finally, March 15, 1820, but it was not until August 10, 1821, that Missouri became a state.

AN ELECTION WITH ONLY ONE CANDIDATE FOR PRESIDENT

Though the dispute occurred during Monroe's administration, it did not make any enemies for him. At the end of his first term, no candidate opposed him. He received the vote of every elector except one, who voted for John Quincy Adams, saying that no man except Washington should receive a unaminous election. The Federalist party was dead and only the Republican or the Democratic-Republican, as it was beginning to be called, was left, though all men did not have the same ideas.

Another important event of Monroe's administration was the announcement of what is known as the Monroe Doctrine. The Spanish colonies in South and Central America had rebelled and gained their independence, but Spain was hoping to get them back by force. In 1823, President Monroe sent a message to Congress saying that the United States would object if any European power should attempt to take any part of North or South America. We would not interfere with the possessions they had then, but they must not try to get any more.

During Monroe's time a great public improvement which had great influence was built. This was the Erie Canal, which reached from the Hudson River at Albany to Lake Erie. It was begun in 1817 and finished in 1825. The man who had more to do with it than any other was De Witt Clinton, whose picture you will find on another page. The canal boats were pulled by horses and traveled very slowly, we should think, hardly more than three miles an hour. But a team of horses could pull a heavy load, many times as much as they could pull up the mountains.

THE ERIE CANAL CAUSES A GREAT INCREASE IN WEALTH

The effect was wonderful. Before this time it cost about $120 a ton or six cents a pound to carry goods from New York to Lake Erie. Soon the rate fell by way of the canal to less than a cent a pound. The canal boats carried passengers also. Before the canal was built New York City was growing very slowly. We are told that between 1810 and 1816, the population increased only thirty-six hundred. Between 1820 and 1830, the population increased nearly sixty thousand, and continued to increase. The new York merchants grew wealthy selling goods to the West, and the people in that region were delighted to be able to get goods out of or into their country so cheaply. The rush toward the West began again, and soon Michigan Territory, from which the states of Michigan and Wisconsin were made later, gained many settlers.

MASSACHUSETTS AND VIRGINIA FURNISH THE PRESIDENTS

The next president after Monroe was John Quincy Adams, whose father had been president before him. He had great faith in the growth of the United States and wanted to gain more territory than we then had. He was in favor of taking Canada, buying Texas, annexing Cuba and of extending the United States to the Pacific. He believed that some day all this territory would be needed, but he was a man who made more enemies than friends and could not get Congress to act

SCENES IN WESTERN LIFE

Before the days of railroads in the West, judges and lawyers traveled from courthouse to courthouse on horseback, as the roads were too rough and too narrow for carriages, and there were few bridges across the streams. When Abraham Lincoln was a struggling young lawyer in Illinois he traveled like the party you see in the picture, and amused his companions by his stories.

When the Mormons were driven out of Illinois, and Joseph Smith, the founder of the sect, was killed, Brigham Young, the new leader, went in search of a new home. Far beyond the inhabited region he came upon the Great Salt Lake and there determined to found a new state where his people would not be disturbed. This was the beginning of what is now the state of Utah, where there are still many Mormons.

as he wished. One reason was that the people of the new states said that they were tired of having the president chosen from Massachusetts and Virginia. At the end of Adams's term, the Constitution had been in operation forty years. During that time Virginians had been president thirty-two years and Massachusetts men eight.

Therefore at the election in 1828, Adams was badly defeated by Andrew Jackson, the hero of New Orleans. Though Jackson was born in North Carolina, he had removed when a young man to Tennessee, then considered a part of the West, and became very popular with the people across the mountains. The common people thought of him as one of themselves. The other presidents had been men of education and the Westerners called them aristocrats. Jackson had been born poor, and had little education. He had endured the hardships of life on the frontier, and had been a famous Indian fighter, and knew what the people of the West wanted. His election meant that what Europe thought or said would have less influence than it had had before.

JACKSON, THE WESTERN MAN, BECOMES PRESIDENT

So many interesting things happened during the eight years Jackson was president, that we can tell only a few. The trouble about the United States Bank is very hard for young people to understand, and we can only say that Jackson had his way and destroyed it. South Carolina felt that many of the laws made by Congress to help the manufacturers of New England were unconstitutional and unjust, and declared that she would refuse to obey, or "nullify" them. But though Jackson had been born in the South, he said that the Union must be preserved, and that if necessary he would send troops to make South Carolina obey.

This attempt of South Carolina to nullify the laws of Congress showed that the South was getting restless and some wise men began to fear the trouble which later brought about the Civil War. The South felt that it must have new territory, but it was not sure where it could get it. No new states had been admitted for fifteen years at the time Arkansas came as a slave state (June 15, 1836), balanced by Michigan (January 26, 1837). What is now Oklahoma had been taken for the Indians, who were made to move from Georgia and Florida. Except Florida there was no more territory in which slavery was permitted.

HOW TEXAS GAINED HER INDEPENDENCE

The country along the Gulf of Mexico, beyond the United States possessions was called Texas by the Spanish and Mexicans. Americans began to move into this region about 1819, and very soon large numbers had arrived. Both Adams and Jackson tried to buy the territory but Mexico, which had gained her independence from Spain, refused to sell. The Texans began to talk about independence, and in 1835, fighting began. The Texans soon showed that they were better fighters than the Mexicans, organized the Republic of Texas, and asked to be admitted to the United States. Many nothern men opposed taking Texas, because they feared that it would give so much more slave territory. We shall hear more of Texas a little later.

During Jackson's term of office the first railroads were built in the United States, anthracite coal was used in an engine, a reaping machine was invented, and many other important inventions began to come into use.

After Jackson came Martin Van Buren. His administration was unfortunate, as times were very hard, especially in the West, where nearly every man was buying or selling land. The people then believed that every little village would some day be a great city, and everybody speculated in land. Some of these villages have since grown into cities, but all could not grow at once.

A NEW PARTY ELECTS A PRESIDENT WHO SOON DIES

Van Buren was given only one term and was followed by William Henry Harrison, a soldier of the War of 1812 and a famous Indian fighter. The party which had elected him had grown up during Jackson's time and its members were called Whigs. President Harrison died only a month after he became president and the vice-president, John Tyler, of Virginia, succeeded him, but he spent most of the time that he was president quarreling with Congress.

All this time daring explorers and settlers were going further and further west. The American Fur Company had opened a road to the Oregon country. Captain Bonneville, in 1832, discovered the Great

THE MEDICINE DANCE OF THE WINNEBAGO INDIANS

You read something of the "medicine men" on page 18 of our book, and there learned of the powers they were supposed to exercise over the evil spirits, which brought sickness and other forms of bad luck. Here we see the "medicine dance" of the Winnebago Indians, who are a branch of the great Dakota family, which is more commonly called the Sioux. The original picture was drawn by an officer of the United States army who had spent much time among them. The Winnebagoes have always opposed us. They fought for the French during the French and Indian War, and for the English during the Revolution and the War of 1212.

Salt Lake, and missionaries to the Indians settled in Oregon a little later.

John C. Fremont, a young army officer, made three trips to explore the Rocky Mountain country in 1842, 1843 and 1845. He had good guides and traveled over a large part of the country, but hardly deserved the name of "Pathfinder of the Rockies," which his friends gave him.

President Tyler greatly favored annexing, that is, joining Texas to the United States, and in spite of the opposition of those who opposed slavery, succeeded just before the end of his term. Texas became a state, with the right to be divided into five states later if it desired. But the Texans have been so proud of the size of their state that they have never wished it to be divided.

President Polk wishes to extend our territory

The next president, James K. Polk, of Tennessee, not only wished to add Texas, but California besides. He was determined also to settle the Oregon question in some way. Just what Oregon was nobody knew exactly. The name was given to the country along the Pacific Coast, north of California which belonged to Mexico. The coast had been explored by Spaniards, Englishmen, Americans, and Russians, but for many years there were no permanent settlements.

In 1819 Spain had agreed that she would not claim any territory north of what is now California. Five years later Russia agreed that it would claim nothing south of 54° 40′. This left a large stretch of territory along the Pacific Ocean claimed both by Great Britain and the United States. As it was considered worthless except for furs, it had been agreed several years before, that both nations might settle or hunt in the country until an agreement should be made.

"Fifty-four forty or fight" and the Oregon country

Missionaries and scattered settlers made their way into the region, and sent word that there was excellent land and that the United States ought to have the country. Soon there were several small settlements. The British had no settlements except the forts to protect the fur traders. Great Britain was quite willing to make the Columbia River the boundary line, but this would have given her nearly all of what is now the state of Washington. The Americans demanded all of the country up to the Russian line of 54° 40′, and a popular saying in 1844 was, "Fifty-four Forty or Fight," meaning that if Great Britain would not give up all the Oregon country up to 54° 40′, we would fight for it. But this would have cut Canada off from the Pacific Ocean and Great Britain would not agree. During Polk's administration, by a compromise the boundary line was fixed where it now stands. Great Britain took what is now British Columbia and another large addition was made to our territory.

War with Mexico over Texas finally begins

Mexico had never acknowledged the independence of Texas and had threatened the United States. When Polk sent a man to try to buy California, the Mexicans would not listen to him. Besides Mexico said that some of the land claimed by Texas as a part of that country had never been so called and that she would never give it up. So President Polk ordered General Zachary Taylor to advance into the disputed territory and close the Rio Grande (Great River). Soon a body of Mexicans (April 24, 1846) attacked a small part of his force. The President declared that Mexico had begun war against the United States and on May 13, 1846, Congress declared war against Mexico.

Some northern men oppose the war with Mexico

Not every one was in favor of the War with Mexico. New Englanders generally opposed the war, saying that they did not wish to help the South gain more territory for slavery. Therefore very few men in the army that was raised came from the northern states, but the South was enthusiastic and many volunteers offered themselves for the war. The two chief commanders, Scott and Taylor, were also southern men and so it was called a southern war. New England has generally opposed adding new territory to the Union. You remember how the Louisiana Purchase caused the New England men to threaten to secede. As soon as war was declared, General Taylor was ready to advance.

General Taylor's invincible army advances

Now a series of battles began in which the American arms were always success-

A BUFFALO HUNT IN THE WEST SIXTY YEARS AGO

The early settlers found a few buffalo, or bison as they are more properly called, east of the Alleghany Mountains, but across the Mississippi, millions were found. They roamed the plains in great herds, sometimes numbering several thousand. The Indians captured them by driving them over cliffs, or into deep snow, or by attacking them on horseback as shown in the picture, which was made from a painting. The white man with his gun was a more dangerous enemy and thousands were slaughtered for their hides or for their tongues, and left for the wolves. Now there are only a few left, most of them in zoological gardens.

ful. At Palo Alto General Taylor defeated a larger force of Mexicans on May 8, 1846, again defeated the same troops at Resaca de la Palma the next day, and then crossed the Rio Grande in pursuit of the flying Mexicans. On September 24th, Monterey was captured, though defended by a larger force than the attacking party. A large part of General Taylor's army was then sent to join General Scott, of whom you read on page 1399, who was ordered to land at Vera Cruz on the coast and capture Mexico City.

The Mexican general, Santa Anna, knew of the departure of these soldiers, and hoped to defeat Taylor's little army before marching to meet General Scott. Therefore, with 20,000 men, he attacked the little American army of 5,000 men at Buena Vista on February 23, 1847, but was badly defeated. It seemed that Taylor's army could not be beaten.

While General Taylor was marching into Mexico, General Kearny, who had been sent into New Mexico, captured Santa Fé, without firing a gun, and then turned to aid in the capture of California, but found that Fremont had already aided the Americans living in the territory to take possession of the country.

GENERAL SCOTT IS AS SUCCESSFUL AS GENERAL TAYLOR

Meanwhile General Scott landed at Vera Cruz in March, took the city, and defeated Santa Anna at Cerro Gordo in April. When the march on Mexico City began in earnest, another series of brilliant victories began. Contreras was taken on August 20th, Churubusco the same day, and in September, the castle of Chapultepec, which was a part of the defences of Mexico City, was taken by storm though bravely defended. On September 14th the victorious army entered the city which Cortes had taken more than three hundred years before. The American forces had been wonderfully successful.

Mexico was now helpless and was forced to make peace. All claim to Texas was given up, and in return for the sum of $15,000,000, California and what was called New Mexico were also unwillingly surrendered. From this territory have been made the states of California, Nevada and Utah, and parts of Colorado, New Mexico and Arizona. Five years later another strip of land, south of the two last named, was purchased for $10,000,000 and the territory of the United States proper became the same that it is to-day.

THE NEW RELIGION JOSEPH SMITH PREACHED

But would this wide country ever be filled? It is not all thickly settled yet, but while the Mexican War was going on a settlement was made in Utah which is very interesting. In 1830, Joseph Smith, a farmer living in New York State, published a book which he said was the translation of a book written in strange letters, on golden plates. He declared that an angel had shown him where these plates were buried in the earth. The book said that the American Indians were descended from the lost tribes of the Jews and told of the mighty deeds of Mormon, who was a pious Christian and a great warrior.

A Mormon church was set up in Fayette, New York, but soon moved to Ohio, and then to Missouri. The Mormons were driven out of Missouri, and, in 1840, founded the city of Nauvoo in Illinois, which soon had 12,000 inhabitants. Joseph Smith had entire control in all things, and soon the people of the country began to say that the Mormons were a danger to the state. It was feared that the city would be attacked by a mob and Joseph Smith and his brother were both killed in 1844.

THE MORMONS ATTEMPT TO MOVE OUT OF THE UNITED STATES

The Mormons still held to their belief, in spite of persecution, and determined to move westward, where there were no people to trouble them. In 1847 a party reached the Great Salt Lake, which was then in Mexican territory. Here they set up a government, and brought all the other members out. Many converts were made in the East and in Europe and their settlement grew rapidly. They brought water from the hills to irrigate their fields and raised large crops, which they sold at good prices to travelers on the way to California.

Soon the leaders began to preach polygamy, that is, that it was right for a man to have more than one wife. It was believed that the Mormons were intending to build up an independent state which should not be subject to the laws of the United States but only to the officers of the church, and in 1857 a small army was sent out to keep order, but no

During the whole of the Mexican War our troops seemed always successful. Monterey was well fortified and was defended by a force larger than General Taylor's, but was soon taken. General Taylor's horse "Whitey" was as well known to the army as his owner, and both seemed to enjoy being under fire. At Resaca de la Palma and later at Buena Vista the result was the same.

General Winfield Scott at the head of 12,000 men landed at Vera Cruz, on the Gulf of Mexico, in March, 1847, soon captured the city, and started on the toilsome march into the interior. Finally, after several battles in which his troops behaved like veterans, instead of untrained militia, the capital was taken, September 14th, and the army entered the city of Mexico, which Cortes had taken three hundred years before.

fighting occurred. Many Mormon missionaries were sent to eastern states and to Europe, and thousands of converts moved to Utah. Many walked all the way from the Missouri River to Salt Lake City as the few wagons were needed to carry the baggage and provisions, as much of the country through which they passed had few or no inhabitants. This was a journey of three months, and hundreds perished on the way.

In spite of the presence of the army the Mormons kept up their practices. During the Civil War they were left very much alone, and not until they wished the territory of Utah to be made a state did they declare that they would give up polygamy. Many other charges were made against the Mormons, but they were never entirely proved.

Gold is discovered in California

While this community was growing up other settlements of a different sort were growing up further west. Early in 1848, just before the treaty of peace with Mexico was signed, gold was found in California. The news spread rapidly and the little towns in the West were deserted while the inhabitants dug for gold. When the news reached the East, thousands of farmers left their ploughs, mechanics dropped their tools, clerks and professional men left their desks to seek their fortunes in the gold-fields. Some made the long journey in sailing vessels around Cape Horn, others crossed the Isthmus of Panama, and then made their way north, others took the long, dangerous trip across the plains, suffering much from hunger, thirst, and the attacks of Indians.

The population of California was small when it came under American rule. Though it had been visited by Sir Francis Drake, and had been explored by Spaniards from Mexico, about 1600, few settlers had gone until after the establishment of the missions to the Indians. Father Junipero Serra with some Franciscan friars began in 1769, and before 1823, twenty-one missions and two chapels had been established. Several important California cities and towns have grown up on the sites of the old missions. Among them are San Francisco, Santa Barbara, and San Diego. Many Indians were converted and taught some of the arts of civilization. Following the friars a few Spaniards or Mexicans established great cattle ranches. The property of the missions had been confiscated by the government, after Mexico revolted from Spain, but few settlers had come.

During 1849 nearly 100,000 people poured into California, drawn by the stories that many miners were finding gold worth several thousand dollars every month. Towns sprang up in a night in districts where gold was found. Many of the newcomers were honest men, but many gamblers and ruffians also came, and robberies and murders were frequent. As the country grew so rapidly there were not enough officers to keep order, and so the better men organized what they called "Vigilance Committees" which tried men accused of crimes and punished them if found guilty. When satisfactory courts and laws were established the Vigilance Committees no longer met.

Soon the population of California was large enough to become a state but again the dispute arose as to whether it should be slave or free. The Missouri Compromise line crossed it and both North and South claimed it. The people of the state however wished it admitted as a free state and this was done by the Compromise of 1850.

A similar rush to the gold-fields a half century later

All of you have heard of the Klondike, and know of a rush very much like this one to California when gold was discovered in Alaska. Very much the same sorts of things happened in Alaska which happened in California about fifty years before. When you come to read of Alaska in another place you can understand California better. A visitor to that state now finds it very hard to believe what he reads about the days of "forty-nine," that is, the year 1849, during which there was the greatest excitement.

States admitted to the Union after Texas

Now let us see what states were admitted to the Union after Texas. Iowa was the first, in December, 1846, followed by Wisconsin in May, 1848, both as free states. Then came California in September, 1850, also free. There was little more slave territory out of which to make states. So, in May, 1858, Minnesota, and in February, 1859, Oregon, came in as free states. The South made a strong effort to have Kansas made a slave state

WASHING GOLD AND FIGHTING INDIANS

Much of the gold in California in the early days came from the beds of streams. Prospectors roamed the country examining every brook. The man is shaking the box, in which a shovelful of sand has been placed. The gold is heavier than the sand and sinks to the bottom, while the sand and soil are washed away. This is called placer mining, and any man could do it, as no expensive tools or machinery were required. At the present time most of the world's gold is obtained from deep mines.

While bands of travelers or settlers were crossing the plains in wagons, they were sometimes attacked by Indians, who attempted to drive off their cattle, if they could not capture the wagons. When we think of the dangers and the hardships of pioneer days in the West, we wonder that any were brave enough to risk crossing the plains. Perhaps your grandfather can remember these days.

but failed, and in January, 1861, just before the Civil War began, Kansas became a free state. We shall tell you more about the struggle for Kansas in our next story, which will tell also how the South, finding it could not keep the number of slave states equal to the free states, tried to leave the Union.

Now let us look back over the growth of the West. We saw that Vermont, Kentucky, Tennessee and Ohio were once western states, that the Louisiana Purchase made the land beyond the Mississippi the West. Then we gained two other great pieces of territory which carried our country to the Pacific. One of them, called Oregon, we gained by discovery, exploration and settlement; the other, the Mexican territory, by conquest and purchase.

This is the Santa Barbara Mission on the edge of the city of Santa Barbara. Most of the missions are now in ruins, but this is well preserved, and services are still held here. Along the walk beyond the arches the good friars walked and taught the Indians. The chapel is at the right of the picture.

Much of this territory seemed useless at the time we got it. Few people thought that the Oregon country was really worth having, and much of the Mexican territory has remained a desert to the present day. We are just learning, however, that much of the soil needs only water to make it very fertile. Therefore, the government is building dams in the mountains so that the people may preserve the water of the melting snow and use it as it is needed instead of allowing it to run away in waste.

Hardships of life on the plains

Into the land beyond the Mississippi, the people went, suffering many hardships and risking their lives in many ways. Beside the great roads, which the wagons followed, were seen the bones of horses, oxen and men who had died on the way from hunger and thirst, from exhaustion, or from the attacks of Indians. Some of the land they crossed seemed a hopeless desert then, though it is now being made fertile by bringing water to it.

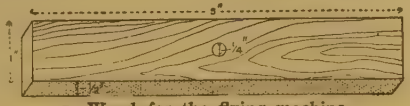
These Western pioneers and their descendants wrested the land from the wild beasts and the Indians, and have made a civilized country of it. Where a few thousand Indians once lived there are now many millions of people. Broad ranches, fertile farms and great cities now occupy the country where buffalo herds made the only roads there were. Of course, the railroads have had much to do with this growth.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 2041.

A SIMPLE FLYING MACHINE

CONTINUED FROM 1741

MOST of us know that the propeller of a steamship, as it revolves, drives the ship through the water. This is because the slope of the blades drives the water away from the ship behind, and this pushes the ship forward. A very simple flying machine can be made on the same principle, and when we have made it we shall perhaps understand better how it is that a ship is driven forward by the revolution of its propellers.



1. Wood for the flying machine

2. Cutting one of the wings

3. The wings after cutting

First, we get a piece of wood about 5 inches long, 1 inch wide, and half an inch thick, as illustrated in picture 1. Soft wood, such as is used for firewood, will do well enough, so that we may simply take a piece of firewood if we can find a piece large enough each way. Right in the middle of it and on the flat side we bore a hole about a quarter of an inch in diameter. We can do this with a gimlet, and we must do it carefully and slowly so that we do not split the wood. The hole is made right through from side to side of the wood. Picture 1 indicates the position and size of the hole. A little distance from this hole at one side we cut away the corner until we get it down to look like picture 2. The end of the piece that we have cut will be almost triangular in shape. Now we begin at the opposite corner at the same end of the wood, and cut it away also until we have one end of the wood almost up to the hole in the form of a slanting blade, but very thin. Its resemblance to the blade of a ship's propeller begins to be seen, and it will look something like the right end of picture 3. We make the corners of the part we have cut round instead of leaving them square. This improves the appearance. That finishes one end of the blade. We do the same with the other end of the piece of wood, except that we cut away, not the same corners as we have cut away in the first end, but the opposite corners. Then we shall have the two ends cut away to the form of thin blades, but the slope of the one will be opposite from that of the other, as shown in picture 3. Our toy is almost complete.

We have now to fix a stem firmly into the centre hole. A butcher's meat skewer, if made of wood, will do for the stem, or a wooden penholder, or even a thin lead pencil. The stem may be any length from 6 to 9 inches. We may glue the stem into the hole, but it is not really necessary. It will be sufficient if we push it in firmly, but not so far as to split the blades. When we have the stem fixed, we have only to hold the toy upwards with the stem between the palms of the two hands, then rub the hands together quickly, and release the machine as we make it spin. It should soar aloft as high as the roof of a house if we have done it properly. If we have not done it properly, we may find that the toy strikes the ground at once instead of flying. If so we may know that we have spun it in the wrong direction before releasing it, and we can do better at the next attempt. A little practice will enable us to make it soar high every time.

4. The completed flying machine

5. Flying the machine

MAKING A SET OF DOLL'S FURNITURE

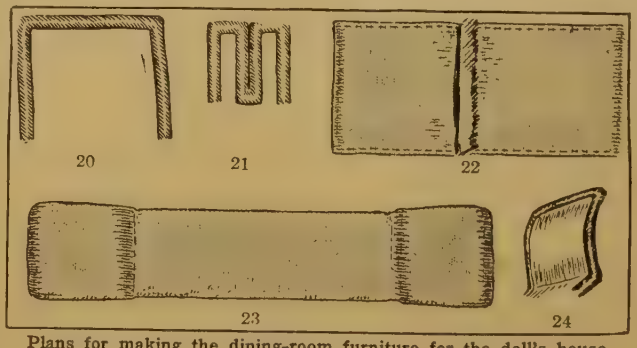
THE DINING-ROOM AND THE KITCHEN

WE learned how to make the drawing-room and bedroom furniture for our doll's house on page 1733; for our dining-room suite, which we are going to make to look like walnut and crimson velvet, we want several yards of brown silk-covered wire at a few cents a yard. This is thicker and handsomer than the black, yet not so good for small curves. But our suite is massive in pattern, so this is just the thing.

The chairs are made on the same plan as those described on page 1734, except that they do not have a second band of wire round the seat. The shape of the back of the small chairs is shown in picture 21. The angles should be well squared with the pliers. A good way to protect the silk covering of the wire from injury is to tie the tip of the little finger of an old glove on to each claw of the pliers. The easy-chairs, made deep and wide (about 1¼ inches at the back for the seat and 1½ inches in the front), have a plain square back like picture 20, and the one with arms has them quite plain to match. For the cushions we need some ribbon velvet 1½ inches wide, and a little wadding or cotton-wool.

Dining-room set of furniture for the doll's house.

Measure from the top of your easy-chair back to the edge of the seat in front, and take a piece of velvet about twice as long. Double the two ends over towards the middle, in proportion to the sizes of the back and the seat. Let the ends meet with a quarter of an inch to spare. Stitch the edges together very neatly, with silk to match if possible, along the selvedge of the velvet (or turn and do them on the wrong side, which is even neater) so that you have two little square pockets with their openings together, like picture 22.



Plans for making the dining-room furniture for the doll's house.

Stuff a pinch or two of wadding into each pocket, and hem down the spare quarter of an inch to keep it in. This is, of course, the wrong side of your cushions. Turn them over, and attach them neatly to the framework of the easy-chair, so that the "woodwork" shows all round the back. Poke the velvet well into a deep crease between the back and the seat. It may need a few extra stitches there.

The small chairs will be quite easy to make after this, as they only need a square cushion the size of the seat. This may be made by covering a piece of card with the velvet, putting a pinch of wadding between velvet and card.

The back and arms of the sofa are quite plain and square, the arms being as high as the back. The back is filled with one long cushion, wadded and joined up at the end. Another cushion goes over both arms and along the seat. A piece of card the shape of the seat is covered with velvet, with a little strip of wadding to plump it up. Enough velvet is left at each end to double over and make cushions for the arms, as shown in picture 23.

When the cushions are fixed in place the ends of the arms should be slightly curled over, as in picture 24. Since the sofa cushions will not take the whole width of the velvet, it is better to join them on the wrong side and turn them. Where the card is, the selvedges can be drawn together across it with long stitches, the same as in the cushions.

The table is very simple, just like the legs and seat-frame of a chair, with rather longer legs, a side about 3 inches and an end 2 inches long. If the wire is soft enough to allow of the legs being twisted, they will look much better. Allow half an inch extra length for this. The top is of satin or sateen to match the wire, stretched over card.

The carving table begins just like the table—the legs about half an inch high, starting with the back leg first. The end measures 1¼ inches, the side 2 inches long.

When the legs and sides are done, quite firm and square, bend the wire upwards for 1¼ inches from the top of the last leg. This is a pillar to support the upper shelf. Then turn sharply at right angles again to form the side of the shelf, which must be exactly the same length as the one below it; then another pillar, which is just like a leg, sewn securely to the top of the leg underneath, and so on, till we get round a second time. A third circuit, this time with tiny "legs" of a quarter of an inch, sticking up instead of down, to form ornamental knobs at the four corners, finishes the framework. The *last* turn of the wire is carried down the *first* pillar, to make it double, like all the

others, and it is then cut off, and the end neatly tucked away behind the first leg. The two shelves are simply made of pieces of card, cut very carefully to fit the frame, and covered with brown satin or sateen.

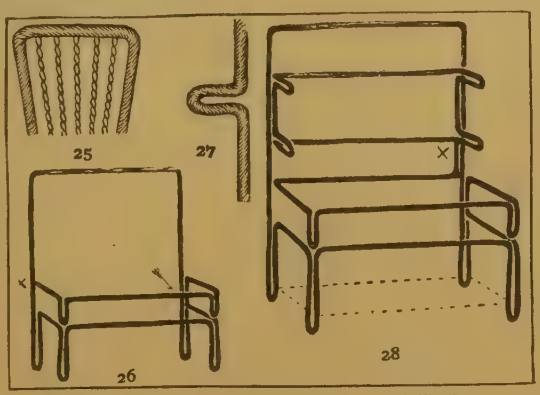
The last room in the doll's house which we have to furnish is the kitchen.

The furniture is all made with thick brown satin wire and sateen to match. The chair is made in the same way as all the other chairs already described, the square-cornered back being filled with bars of brown embroidery silk set in and twisted just like the rails of the bedstead, as shown in picture 25. The grandfather's armchair is the same thing made larger, with a higher, wider back, and square arms filled with bars. The table is just like the dining-room table, except that the top is made of sateen instead of satin. The chair-seats are also of sateen, to look like plain wood.

Kitchen furniture for the doll's house.

The special piece of furniture in the kitchen is the dresser. It is the most difficult thing we have yet attempted, and for that reason it has been left to the last. It should not be started with less than two yards of wire, as it is made throughout without a join.

Start on a back leg (at the point marked with an arrow in picture 26), which should be about 1½ inches long. Then carry the wire straight up to form the high back of the dresser. This should be 3 inches beyond the top of the leg, and 3½ inches wide. Bring the wire down to the bottom of the opposite back leg, and when this is formed by turning the wire back on itself and doubling it closely as usual, bend the wire towards the first front leg, making the side of the *lower* edge of the table part of the dresser about 1 inch long. When the first front leg is done, carry the wire along the front of the dresser 3½ inches to the last leg, and turn round the corner and along the second side or end of the table part to the point where you started.



Plans for the kitchen furniture for the doll's house.

You now have made what looks like the beginning of a sofa with a heavy high back. Every angle and every joint must, of course, be firmly secured with thread of the same color as the wire. When you have brought your wire round to the point where you began, carry it upwards parallel with the back for five-eighths of an inch, and fasten it firmly.

Then make the *upper* edge of the table part, coming along the side 1¼ inches towards the front, and making what one may call a little leg, quarter of an inch long, exactly over the front leg, to which it must be strongly stitched.

Then go along the upper edge of the front 3½ inches, and make another ¼-inch leg just over the other front leg, turn the corner, form the upper edge of the end of the dresser, and fasten the wire to the back at the proper distance—quarter of an inch—above the top of the back leg. The dresser now looks like picture 26. The wire is at the point marked by the x. Now carry the wire across the back on a level with the upper edge of the table part; and, having secured it, take it a distance of three-quarters of an inch up the back, double it (as in picture 27), making a projection, or horizontal "leg," quarter of an inch long as a support for the first shelf.

Carry the wire upward another three-quarters of an inch, and form the projection for the upper shelf. Carry it now across the back, and form a corresponding support for the upper shelf at the other side. Turn downwards to make the second support for the lower shelf exactly opposite to the first, and secure your wire at the point marked x in picture 28 (drawn larger than picture 26). All that remains to be done is to carry the wire across the back of the dresser once more, and to fasten it off by turning it round the back wire just below the first support for the lower shelf, and, nipping the end closely, to sew it down upon itself. The finished framework of the dresser looks like picture 28. Fasten off at the point marked x. Now cut a piece of card to fit the back, 3 inches long and 3½ inches wide, not too thick, or it will be top heavy, and so fold it up in a piece of sateen, 7 inches long and 4 inches wide, that the edges of the sateen can be turned in, and the whole sewn up entirely to cover the card, the same way as we made the top of the dining-room table, and fasten it in place. A top to the table part of the dresser, cut to fit, and a front and ends must also be neatly made, and fixed in place. Narrow strips of card covered in the same way form the shelves resting on their supports, and, lastly, a pot-board covered with black may be fixed where shown by the dotted line; this will help to balance the back.

In another part of the book we learn how to make the doll's house itself.

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO IN THE MIDDLE OF OCTOBER

THE subject of planting bulbs in the open ground has already found a place in these articles, but it is possible that a good many varieties could not be planted earlier than the present time, as the little plot was full of summer and autumn flowers. All this month bulb-planting in the open ground can take place; yes and even early in November where necessary, but we must bear in mind that the sooner it is done the better.

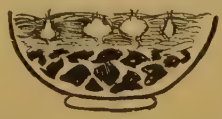
Enough has already been said as to the manner of planting. To-day we will think for a few moments of another, and, to some of us, quite the most fascinating and interesting method of growing bulbs. It means a miniature garden of flowers in the house, for we are going to consider the growing of all kinds of bulbous plants in glass or china bowls.

First of all we obtain our bowls and the prettier they are the better, though even pudding dishes would do. In the bottom of the bowls some bits of charcoal may be placed; charcoal keeps everything sweet and healthy, and it is a good plan to have a little always at hand, and even to mix a little with potting soil when replanting any of our pot plants.

Hyacinths grown in a bowl.

But to return to our bowls. Upon the charcoal we place coconut fibre and shell mixed, and it may be as well to say that this can be bought, mixed together in the right proportions, as coconut fibre refuse, for thirty cents a peck. We bury the bulbs in the fibre and keep it in the dark, just as was described for bulbs planted in ordinary flower-pots in soil, and for about the same length of time, the reason being, as we shall remember, to encourage the growth of the roots before top growth begins.

The watering is an important consideration, and we quote the following directions as being particularly clear and easy to follow: "Care should be taken that the fibre is never allowed to get dry, or failure is sure to ensue. If the bowls are filled with water once a week, and then tilted, pouring off the surplus water, that will ensure the fibre keeping evenly moist throughout the bowl." After the bowls are brought from their dark quarters they should be kept from very strong light for a few days, but after that they may be placed in some sunny spot close to the window, and during the winter they should be kept free from frost. Narcissus are very beautiful grown in this way; so are the delicate-looking little Roman hyacinths.



Preparing the bowl with charcoal and coconut fibre.

As the summer and autumn flowers fade in the garden a very busy time begins. Much depends upon the weather, but the time is approaching when we must put everything in order for the winter. The whole plot will have to be dug over, but it will be most important not to injure the hardy plants that will remain. Therefore, where there are many of these, it is safer to dig with a fork than with a spade, for, of course, a spade is much in danger of cutting roots through if it comes across them. Annual plants may all be pulled up and carted away as they cease to flower.

We must remember that many of our hardy perennial plants die down for the winter, their leaves and stems wither and die, but on no account must we conclude that the plant is dead; the roots are very much alive, and in the spring beautiful fresh young growth will peep through the soil. Nature has a wonderful way of using all sorts of methods to enable her hardy plants to pass the winter safely. Some, like these hardy perennials, are, as it were, going to sleep, and some, like the bulbous plants—the snowdrops, and winter aconites, and others—are waking up, for these take their sleep during the hot summer months. Some plants remain fresh and green winter and summer alike, like the sweet-william, the beautiful little dwarf gentian, and the pinks and carnations. Just as everything was made neat and trim for the summer, so during the next few weeks must everything be made neat and tidy for the winter. All dead leaves, stems, etc., should be cleared away, and stakes taken up and stored, except where plants, like chrysanthemums, need them still.

Now, if our gardens were only made and planted in the spring, our hardy plants will not need dividing, but if they have been made two or three seasons then probably some of them will be all the better for it. Say we have some large clumps of campanulas—the beautiful blue or white bell flowers. We lift the whole clump, and take a sharp knife and cut it into three or four portions, and replant each one separately. The reason we divide clumps that have grown to a large size is this: they throw up too many flowering stems for these to be well nourished and produce a fine blossom, and, in consequence, towards the centre the plant grows poor.

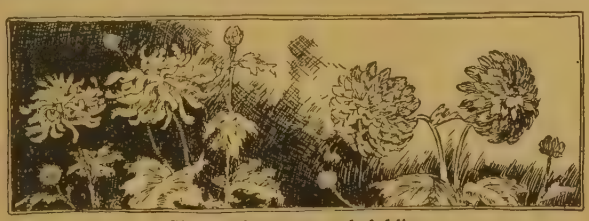
We should remember that it is good for the future welfare of a plant to replant it on a different spot from that which it has been occupying. If we do not need all the pieces we can make of a divided plant, we should replant the strong or outer portions of our campanula; and if we have any seedling plants not yet put into their flowering quarters, we should get them there without delay.

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO AT THE END OF OCTOBER

ALL the work among the hardy perennials, and digging, and trimming that was advized in the last part may still be done if not already completed. The chrysanthemums, the dahlias, and the Michaelmas daisies are still making our plots glad and gay with color. When a sharp frost does come and blackens all the tops of the dahlias we need not be frightened, but when that happens the time has arrived to dig up the plants. If we put them into the ground in early June as rooted cuttings, we shall be surprised to find that, in the meantime, these roots have become large tubers. We take them up as carefully as possible so as not to injure them; then we let the wet soil that hangs about them become quite dry. It may take some few days, so that we must be careful to place them somewhere out of reach of any night frost that might occur. After this we store them for the winter; and the best way is to put them into something and cover them well over with *dry* sand or soil.

We may treat our gladioli in exactly the same way, but we should not lift them until the tall, sword-like foliage is turning brown and withering, for the foliage is of use to the plant just so long as it remains green. It is very important to store them where no winter frost, however sharp, shall touch them, for this makes them turn soft and decay.



Chrysanthemums and dahlias.

The present is an excellent time to buy hardy perennial plants if we do not feel that our little gardens are sufficiently well stocked. With all the summer behind us, we have had full time to make up our minds what are our favorite plants, or what we have seen in other people's gardens that we desire for ourselves. We have probably found out by this time that often there are many varieties of a plant, and that it is deeply interesting to grow several of these varieties. Let us take the case of the *Dianthus* family. This includes our lovely carnations and the red and white pinks, and also the sweet-williams and many others well worth growing. This relationship of plants to one another is one of the things you may well study; and I do not think you will do better than to turn to the pages of some good catalogue, look up the plant that you seek—say, this Dianthus—and discover for yourself what a large family party it includes, and gradually, perhaps, you will come across first one, then another. You will rear this from seed, and that you will buy, someone will give you a third, and so on. The campanulas, the primroses, and the pinks all belong to large families.

When we are thinking of taking cuttings of geraniums and other plants, it should be noted that if cuttings are taken of the useful yellow calceolarias, there is no need to take them so early as was necessary for the geraniums. The end of October, however, is quite the best time for this work. Calceolarias are almost hardy, so that they need but little winter protection. They may be put into a frame, and have air every day through the winter, except when it is frosty or wet, by raising the lights; or we have seen them brought quite safely through a severe winter merely planted outside in the border under the wall of the greenhouse, and some stout boarding put in front of them and over them which was wholly removed during most days. I think we may say that every one of our little plots should boast its rose-tree, one at least, and another if we can spare the space for it. It needs to have the ground it is to occupy quite deeply dug; yes, even to the depth of two feet if that be possible without coming to the subsoil. Secondly, it likes plenty of good rich food; and we supply this to a great extent if we dig some well-rotted stable manure into the soil.

It is not enough simply to dig the hole into which the rose is to be put, but the soil all round it needs to be dug over, so that the roots, wandering in search of food, may spread out in all directions. The soil may be allowed to settle for a few days while we decide upon the names of our roses. Perhaps one or more may be chosen from the following short list:

Caroline Testout—one of the best bright-pink roses ever grown.

Viscountess Folkstone—free flowering, pale flesh-color.

La France—a little paler than the Caroline Testout.

General Jacqueminot—a bright red.

Ben Cant—a deep crimson.

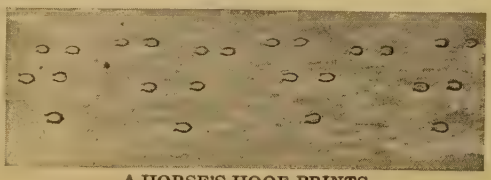
Frau Karl Druschki —a fine white rose.

Or it may be we should like to have a little monthly or China rose, that is as strong and able to take care of itself as a wild hedge-brier; or, even, we may have a fancy for one of the dainty little Scotch roses, either white or yellow. The Scotch rose will flower even in a garden that gets but little sunshine; whereas the rose generally may be regarded as a sun-lover, and the position chosen should be as free and open as possible. The hole must be dug large enough to allow the roots to spread out on all sides; no doubling of them under, or bending them around to make them go into a hole too small. No, indeed! the roots must be spread out quite freely, then the soil filled in, not merely thrown in loosely, but you may carefully tread it firm round about the newly planted tree.

HOW TO FOLLOW A TRAIL

THERE are few pastimes that can be enjoyed in the country more interesting and more likely to develop our powers of observation than that of following a trail or tracking some person or animal from place to place. We learn to use our eyesight to the full extent, seeing things that others do not see; we get into the habit of noticing the smallest details, and we develop our brains by associating together things and ideas and signs.

We all know the story of the dervish traveling in the desert of Arabia, who astonished people by his apparently wonderful powers, but whose real power was simply that of the observing eye. A camel was lost, and the dervish, without seeing it, knew that it was blind in its right eye and lame in its left leg; that it had lost a front tooth, and was laden with honey on one side of its back, and wheat on the other. He knew that a camel had strayed, for he had seen its lonely track in the desert, without any signs of a man accompanying it; he knew it was blind in one eye, for it had cropped the grass on one side of the track only; he knew it must be lame in one foot because that footprint was less distinct than the others; he knew it had lost a tooth because, wherever it had grazed a small tuft of grass was left in the middle of every bite; and he knew from the busy little ants on one side of the path and the flies on the other side that wheat had been carried one one side and honey on the other.



A HORSE'S HOOF-PRINTS
First line, walking; second, trotting; third, galloping.

This power is a very valuable one, and we may all, by constant practice, become more or less master in it. To develop it, no practice is better than that of trying to follow a trail. It may not be very easy at first, but we must not get discouraged but must persevere, and we shall then soon find that we can see what others cannot see, and the interest of it will grow, and we shall then be following trails most enthusiastically.

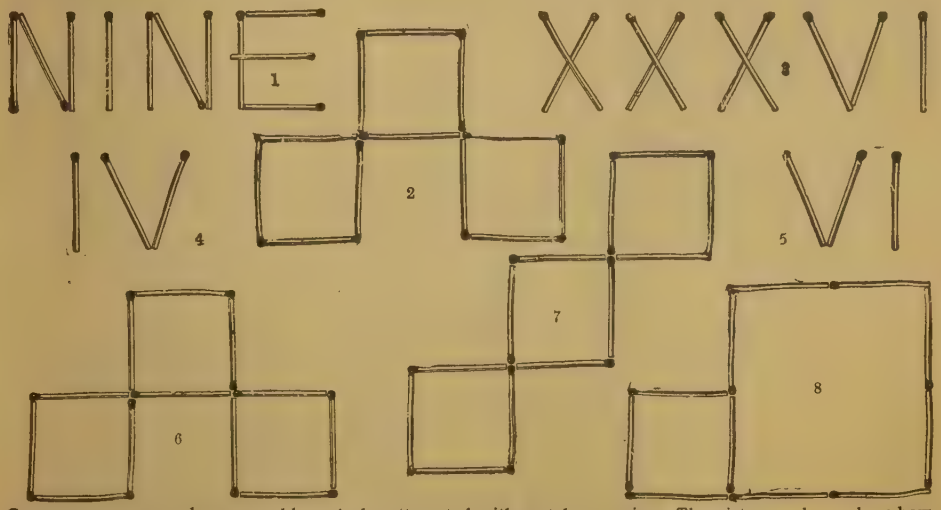
BIRD TRACKS
First row, a ground bird; second row, a tree bird; third row, a bird that lives partly on the ground and partly on the trees.

It is better, in starting, to select some place where footprints leave a more or less distinct impression. In winter, of course, the ideal conditions are found after a fall of snow, when the footprints both of birds and animals are clearly imprinted; and in summer we may take up a trail—that is, start following footprints—in a dusty or muddy road. There may be the footprints of a number of people all in the same road. We select the one to be followed, and it will be of great assistance to have a notebook in which to write the measurements and particulars of the footprints, so that we shall have it for reference later in our expedition. We now follow the trail of the footprints, noting its character as we go along, and seeking to discover something that shall tell us about the person whose prints we see. For instance, we can tell at what pace he was going. When a man walks, he puts the whole flat of the foot on the ground, and the distance between the footprints will be slightly less than a yard. If he runs, the distance from print to print will be rather more than a yard, and the toes and front part of the foot will be more deeply impressed than in walking, especially if the ground be soft. There will also be a little of the ground kicked up by the toes each time the foot comes down, and this will be noticeable. Where different footprints clash, we must be careful to note any peculiarity in the one we are following—the order of hobnails, the size of rubberheels, and so on.

If we miss the footprints owing to the road getting less dusty or snowy, we must not give up. We should carefully mark the place where the last footprint is visible, and then move round in front of it in a wide semicircle, seeking for some sign that will help us to continue the trail. If the sun is shining, it is always a very good plan to look along the surface of the road against the sun. Very often an indistinct trail can be seen in this way when it is invisible otherwise. This is most particularly the case with the track of a bicycle or motor-car on a hard road, as these leave but very faint traces.

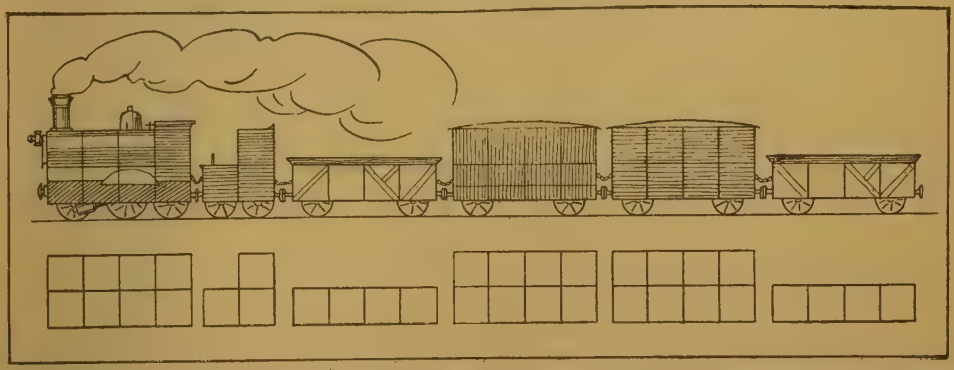
Should the footprints turn off across a field, it is often easy, by looking well ahead, to follow the trail by noticing the blades of grass slightly trodden down and pushed to right and left. In a wood, broken twigs are generally tell-tales, and will help to keep us on the right trail. The hoof-marks of a horse are perhaps the most distinct and are easier to follow on a road than the footprints of a man, for the animal, being so much heavier, leaves a far deeper impression on the earth. The first picture on this page gives us an illustration how the hoof-prints appear of a walking, a trotting, and a galloping horse. The footprints of birds and of animals like cats and dogs are very interesting. It is possible for us to know the character and habits of a bird from the impression of its feet. If the footprints are one in front of another, the bird walks, and is a ground bird; if the prints are side by side, then it hops, and is a tree bird; and if, in a single trail, the prints are sometimes of one kind and sometimes of another, the bird lives partly in trees and partly on the ground. The second picture shows very clearly how the three kinds of tracks appear.

ANSWERS TO THE MATCH PROBLEMS ON PAGE 111



On page 111 appeared some problems to be attempted with matches or pins. The pictures above show how these problems are solved. It will be seen that a few of them are just "catches," but they are all interesting.

A RAILWAY TRAIN BUILT UP FROM SQUARES



On page 1097 we saw how to build up some queer figures from squares. Here is a train which can be made in the same way. The little sketches below show us how to start building, with the squares as the foundation.

FORFEITS

IN most of our games we claim forfeits from the unsuccessful players, and no party would be complete without forfeits. In addition to those which are ordinary and well-known forfeits, there are others which puzzle those who have to pay them, and cause much merriment among the spectators. Here are some which are well worth trying in any large party.

Hold one ankle in one hand and walk round the room.

Walk round the room and smile at six persons in turn.

Stand on one leg and count two hundred.

Spell some long word, like "parallel," backwards.

Go round the room and give a piece of good advice to everyone in the company.

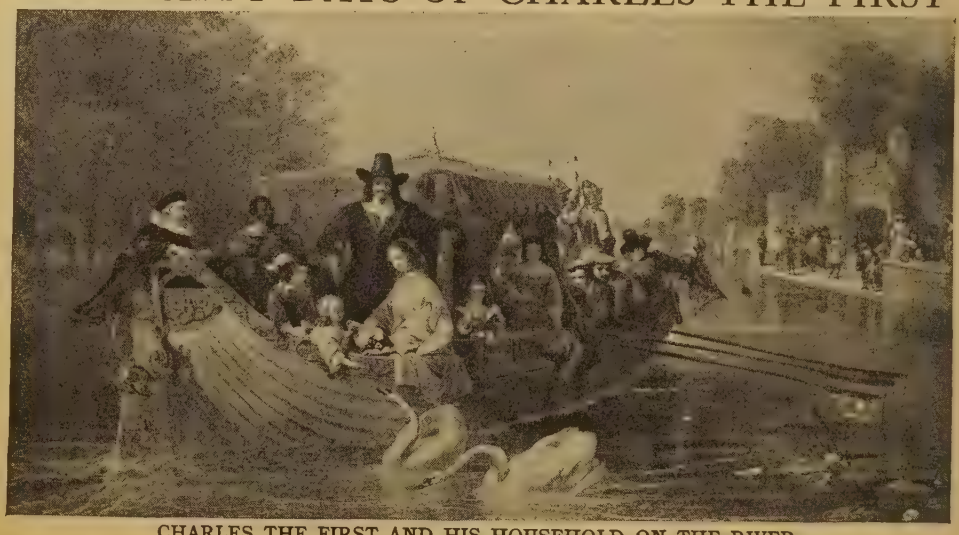
The German band forfeit enables several players to pay off at one time. Each selects some instrument, and then all go to the middle of the room and try to imitate the instruments they have chosen, both in sound and in their method of playing.

The player has to compare each person in the room to some object and give a reason for the likeness.

In the cat's concert a number of players who are to pay forfeits go to the centre of the room, and, at a given signal, each sings any song that he likes. Of course, no two are likely to sing the same song, and so the mixed sound that arises can be easily imagined.

THE NEXT THINGS TO MAKE AND TO DO BEGIN ON PAGE 1937.

THE HAPPY DAYS OF CHARLES THE FIRST



CHARLES THE FIRST AND HIS HOUSEHOLD ON THE RIVER

THE CHILDREN OF CHARLES THE FIRST: CHARLES, JAMES, AND MARY

These two pictures were painted during the happy days of Charles I., when he lived with his children around him, before he yielded to the evil counsels of others and set himself against the people. There is a beautiful story of these days which tells us that while Charles was hunted up and down the land the leaders of the Parliamentary army would sometimes visit his children, who were captives. They were all courteous to these innocent children of an unhappy father, but there was only one who knelt to them in loyalty, and that was Cromwell. We can imagine the stern Cromwell, who was to hunt Charles Stuart to his doom, kneeling to the king's little son James, who was to become king and to be himself driven from his throne.

WHAT THIS STORY TELLS US

THIS is the story of the men of the Great Rebellion in the seventeenth century by the English people against their king. Charles I. was a man who made many men love him. But it was his evil fortune to be a king, and he believed that God sent kings to rule as they liked, even if they had to act unjustly and to break solemn promises. Therefore from the beginning he insisted on going his own way, often against the laws. But the Parliament men held that the king had no right to set aside the laws, and therefore the king and the Parliament soon found themselves quarreling. Parliament said that the king might not force the people to give him money, or to worship God in any way other than they pleased, and because the king insisted on these things men refused to obey him, and Charles had them put into prison. We read here of men who fought in the war that these quarrels brought about.

MEN OF THE GREAT REBELLION

OLIVER CROMWELL AND CHARLES STUART

CONTINUED FROM 1752

THERE was a great painter called Van Dyck, who made many portraits of King Charles. If you have ever seen one of them, it is easy for you to understand why, with all his faults and his follies, men loved him with a passionate devotion, and how he still casts a spell over men's minds.

There is a dignity, a majesty, in the grave, delicate face, a charm in the haunting, melancholy eyes, a kingly air in the pose, which make you feel that this was a man for whose sake many would die gladly. And yet we can see that it is not the face of a man wise in counsel or strong in action. Grace and graciousness are there, but no jot of power.

Now, if you look on the face of Oliver, it is as though it had been hewn roughly out of solid granite, grim and massive and hard; there is power in every line, but of grace or graciousness no whit. This man is a born fighter and a born leader. The other is born for defeat.

During the first years of King Charles's life he was not the heir to the throne; he became heir on the death of his elder brother, Henry. From his youth, the prince had evil counsellors. His father, King James I., was very clever, but we read on page 1036 how the shrewd King of France, Henry IV., described him as "the wisest fool in Christendom." Never was a monarch so undignified as he; perhaps that is one reason why Charles bore himself always with such dignity. But James gave the prince for a companion a young gentleman who was very handsome, very brave, very proud, and very worthless; whom he made a lord, and who became famous as the Duke of Buckingham. Buckingham utterly won the heart of Charles, and taught him to think that princes and their favorites are altogether above the law. Moreover, it was due to Buckingham that Charles married the pretty French princess Henrietta Maria, who proved, in her turn, a counsellor fully as bad as Buckingham himself, after the duke had been slain by a crazed assassin. So that the two people whom Charles loved best in the world were the worst advizers he could have found, yet it was their advice he always followed.

But of all the ill counsel that he got from these two, or from his father, the worst was their teaching that the word of a king may be lightly given and lightly broken; and this, more than aught else, brought Charles to his ruin. For although the people were wroth with him before he signed the promises in the Petition of Right, they were far more angry afterwards; because, although he may have made himself believe that he broke no pledges, yet he knew well

enough what all men supposed that he meant by the promises he had given; and the people felt that he had played them false. And, again, when he gave up Strafford to his doom, all knew that he had broken his word; and when the Parliament resolved to fight, it was because they would not trust his faith. And at the last, when Cromwell and his party resolved that the king must die, it was because they had lost all hope that he would keep the promises he made if he were allowed to live.

THE EVIL TEACHING OF HIS BOYHOOD THAT COST KING CHARLES HIS CROWN

So that evil doctrine not only brought upon England the countless woes of civil war, but it brought upon Charles himself the loss of his crown and his life.

Yet Charles really believed that he was in the right, except when he surrendered Strafford. For he held that the king is appointed by God, and should rule his people not as the people think good for themselves, but as the king thinks good for them, and that, whether he rules ill or well, none can call him to account save the King of kings; therefore, if his people are disobedient, he may compel them to his will, regardless of law. Besides that, he saw that the Parliament was now demanding rights which it had never claimed before, so that if he gave way there would remain to the king no power at all. And it was this which made some Parliament men, like Hyde and Falkland, go over to the king's side.

Now, after the king had most openly broken the law by entering the House of Commons, seeking there to arrest the five men who were the chiefs of the party that opposed him, he went away from London, and there was little enough hope that war could be avoided. And some months later Charles unfurled his standard at Nottingham, having gathered troops round him; and this was the beginning of the great civil war.

OLIVER CROMWELL, THE MAN WHO WAS TO CONQUER THE KING

Let us see, now, what manner of life had been lived by the man who was to conquer the king. Oliver Cromwell had farmed his lands in Huntingdonshire, seeking to make no stir in the world. Once, indeed, he had come forward in his own part of the country as champion of the people's rights in the matter of certain lands of which they were being robbed. But for the rest he was known chiefly as a very religious man, who for his religion's sake had been willing to leave his own home and seek a new one in America. Some say that he and his company were ready to depart, when, by the king's order, they were stopped from going. When that Parliament met against which the king declared war, Cromwell was one of the members—a rough, uncouth figure, unskilled and confused of speech, but a man of mark by reason of his deadly earnestness. Yet, because his strength lay in action, not debate, it was not at first seen that he was a mightier man than any of the others assembled there.

Then the war broke out, and the tide ran in favor of the Cavaliers and against the army of the Parliament. It was Cromwell who saw how the tide must be turned. He saw that what made Rupert's soldiers so irresistible was the proud sense of honor which made them fear nothing but disgrace. He saw that these men must be faced by soldiers who, being filled by the burning love of a great cause, had no more fear of death than they. Then victory would fall to those whose discipline was best.

THE MEN OF THE GREAT PURITAN ARMY

Therefore, Cromwell went down to the Eastern Counties, and gathered troops of men picked out for their zeal in religion, as well as their strength and valor and horsemanship, and trained them in utter obedience. When they came to the shock of battle these Ironsides swept all before them, yet were ready to rally to their chief's command and stay their hands from needless pursuit and plunder. After their stern fashion they were godly men who believed with their whole souls that their cause was the cause of freedom and righteousness.

So, at Marston Moor and Naseby fight, the Ironsides smote and shattered the gallants whom none before had been able to resist. After the route of Naseby the king's cause was lost, and Charles gave himself up to the Scots, who were in arms to aid the English Parliament, and after a time the Scots gave him up to the Parliament. For what the Scots desired was that the king should accept their Covenant, and should replace the form of worship of the English

Church by Presbyterianism, as most of the English Parliament desired likewise. But, although Charles might easily have won back his crown and most of his power by consenting thereto, this was a thing which he would in no wise do, being as loyal to what he held to be the true religion as any Puritan.

WHY CROMWELL AND THE ARMY RESOLVED THAT THE KING MUST DIE

So the Parliament chiefs sent the king under guard to Holmby House. But now Cromwell and the soldiers were ill content with the Parliament, seeing that it was willing to make terms with the king which would not have secured the liberty of religion, which was the thing they most cared about. Therefore, they sent a troop of soldiers under command of Cornet Joyce to bring the king away from Holmby House and keep him under charge of the Army itself. And then, because the Army, and the Parliament, and the Scots were in disagreement, the king tried privately to treat with each of them, and to make them the more obstinate in their disagreements with each other, hoping that thereby he might yet triumph over them all.

But when he tried to escape from the country, and was stopped in the Isle of Wight and held prisoner at Carisbrooke Castle, the Royalists rose in insurrection, and Cromwell saw that the king had been only making pretences. And so he and all the Army were resolved that when the insurrection was put down there could be no peace in the land unless the king's life were ended and the will of the Army were made to prevail.

THE STRANGE SPECTACLE THAT ENGLAND SHOWED THE WORLD

Then England showed the world a strange spectacle. For they who had risen in arms against their king in the name of the law, which is higher than the king, now set up a tribunal to judge the king which was itself without rights from any law. So that now it was the king who stood for the law, and his judges who stood for arbitrary power, which means power that is not restrained by law. And the Army, having this power, cut off the head of the king in the name of the people of England, though all knew that the chief part of the people of England shrank in horror from the deed.

Thus, in the last days of his life, the king who had wrought so much ill to the land became a martyr, and throughout those days he acted with a most royal dignity and showed great tenderness and courage. He would make no defence before judges who had no right to try him. In his prison he remained calm and collected, mindful of his friends and his children, but with his thoughts bent upon eternity. And when the last hour came, and he stepped through the window of Whitehall on to the scaffold, and looked on the crowds that had gathered to see how a king can die,

> He nothing common did nor mean
> Upon that memorable scene,
> But bowed his stately head
> Down as upon a bed.

And when the executioner struck off his head and raised it, with the words, "This is the head of a traitor," the crowd answered with groans and tears.

THE MANNER OF MAN THAT OLIVER CROMWELL WAS

Let us turn now to the man who, more than any other, had brought about this terrible deed. Cromwell had striven his hardest to make terms with Charles, and to restrain the Army, which would willingly have made away with him long before. But at last he had judged that there was no way left but the terrible way he took. When his mind was made up, he never faltered. On the king's death warrant there is no signature written more firmly or boldly than that of Oliver Cromwell.

For no man could be more utterly merciless than he, if it seemed to him that the need arose for firmness, as he showed when he slew and spared not at the taking of Drogheda and Wexford in Ireland. Yet he had no love for bloodshed; his mercilessness was the more terrible because he loved mercy. He made himself king of England in all but the name, just as he slew King Charles because he could see no other way of restoring order in the land.

He established order and made the country prosperous. The foreign nations, which at first treated England as an outcast state when she had put her king to death, became eager for Cromwell's friendship and feared his hostility. At

OLIVER CROMWELL, THE MAN OF IRON

In the struggle between the English king and the English people, it was Cromwell who led the people's side. He raised an army true to him, to the nation, and to the cause of freedom; and this army was never beaten. After the war was over, King Charles was beheaded as a traitor and his crown offered to Cromwell. But Cromwell would not be king. He ruled England as Protector. This picture, by Ford Madox Brown, shows Cromwell riding, and we see in his face, calm and hard as if hewn out of granite, the power that is missing from the face of Charles, as we see in Charles' face the grace that is missing from the face of Cromwell. In the history of England there is not a stronger, a braver, and a truer man than Oliver Cromwell.

CHARLES STUART, THE FAITHLESS KING

It is easy in looking at this picture, painted from life by Van Dyck, to see why, with all his faults and all his follies, men loved King Charles with a passionate devotion. There is a dignity in the delicate face, a charm in the haunting, melancholy eye, a kingly ease in the pose, which make us feel that this was a man for whose sake men would die. Yet this lovable and much-loved man set the people of England at war against themselves by his yielding to unwise counsels, and his strong feeling that he was sent by God to rule people as he chose, even though he had to act unjustly and to break solemn promises. In the end the king was driven from the throne, tried, and put to death as a traitor; and there is not, in our history, a more sad tale than his.

his bidding the French stopped persecuting the Protestant Vaudois. Since the days of Elizabeth, the foreign nations had cared nothing for England's will or wishes, till Cromwell trained his army, and Blake proved himself a match for Van Tromp on the seas. And Cromwell did this when the country had just been rent with a great civil war, and when one half of it was thirsting to overthrow his government.

OLIVER'S STORMY LIFE ENDS IN A STORM ON HIS GREAT DAY OF TRIUMPH

Perhaps it is not easy to love a man so rugged and ungainly; it was easy to hate him. His enemies hated him so much that during the last years of his life he always wore mail under his dress, lest he should be slain by an assassin. They hated him so that, when Charles II. was called back to the throne, Cromwell's body was torn from the grave to be hanged in chains like a felon's. Yet this was a man whom the great poet John Milton held in the highest honor, they two being well known to each other, and of one mind in affairs of State; for Milton, of whom we read in another part of this book, gave much thought to such matters, though his greatest fame comes from his poetry. It is odd that so strong a man should have had so feeble a son as Richard, whom men called "Tumble-down Dick," about whom we read on page 1040. But with all his massive, uncouth force, Oliver was tender of heart. It is pleasant to think how, when the grim soldier had become the greatest man in the land, he brought his old mother up to live in his house; and because the poor old soul lived ever in fear that his foes would kill him, he made a rule to show himself to her every evening, so that she might go to sleep knowing he was safe.

Cromwell had taken up the task of fighting the king, of killing the king, and of ruling the country, because he saw things that must be done, and no other was fit or able to do them.

"God knows," he said, speaking sober truth, "I would have been glad to have lived under my woodside, and to have kept a flock of sheep, rather than to have undertaken this government."

He was willing enough to lay the task down.

"My work is done," he said, as he lay dying; "yet God will be with His people."

He lived a stormy life; it was fitting that a great storm was raging when the hand of Death laid hold upon him. On the anniversary of two of his great victories, Dunbar and Worcester, the spirit of the great Protector passed away.

THE MEN OF THE TWO ARMIES

LEADERS WHO GATHERED ABOUT CROMWELL AND THE KING

AT first there were three men who stood up in Parliament against the king—Sir John Eliot, John Pym, and Thomas Wentworth. Of these three, the first died, as men say, a martyr to his cause. The Parliament, headed by these three, made the king sign a declaration, which was called the Petition of Right, that it was not lawful for him to make the people pay taxes without consent of Parliament, or to put people in prison unless they were brought to trial, and it was proved that they had broken the law. But he had hardly signed it when he began to demand certain taxes, which, as he said, had nothing to do with what he had signed, and to put people in prison if they refused to pay. But when Parliament came together, Eliot made the great speech about which we read on page 1038—a speech which made everyone more resolute than ever to resist the king's unlawful demands. This made Charles so angry that he had Eliot thrown into prison, and kept in close confinement, so that he became very ill; and still Charles would not make the imprisonment any the less severe, so that after two years Sir John died. And men loved his memory, for he had been a very noble gentleman, caring nothing for his own ease, but ready to endure all things if so he might help to keep England a free nation.

THOMAS WENTWORTH, WHO DESERTED THE PEOPLE'S SIDE & TOOK THE KING'S

Very different was Wentworth, who had been Eliot's friend; for, just after Charles had signed the declaration, Wentworth went over to the king's side, so that the other side, of which he had

been a chief, gave him the name of the Apostate, which means a man who has deserted a great cause. But from that time there was no man who wrought so shrewdly or so sternly to make the king all-powerful as Thomas Wentworth; either because, having seen that there was no hope of king and Parliament ruling in agreement, he thought the rule of the king would be better than the rule of Parliament; or, as a great poet has thought, because he loved the king and hoped thus to save him from destruction; or for some other reason.

At any rate, this Wentworth, with the grim face and the fathomless, unsmiling eyes, was sent first to rule the North of England and then Ireland. With an iron hand he ruled, careless of law, but careless, too, whether the foes he crushed were strong or weak; and all had to obey his will; while for eleven years he ruled without any Parliament.

But a time came when Charles needed more money than he dared demand without Parliament's consent; and when the Parliament met, seeing how strong and clever a servant Charles had in Wentworth, who was now Lord Strafford, and that if Strafford lived he might make the king too strong for Parliament, they charged him with treason before the House of Lords.

How the man who deserted a great cause was deserted by the king

Yet Strafford stood up and defended himself against every charge so shrewdly and skilfully that they saw the Lords must let him free.

Then they resolved to pass a special Act of Parliament, declaring that Strafford was dangerous to the State, and must be beheaded—since they could not prove that he had broken the laws which would have made him guilty of treason. And all the people called for the blood of Strafford; yet he could not lawfully die unless the king consented to his death.

At last, fearing the wrath of the people, and that if Strafford were not slain they would clamor for the life of the queen, whom they hated no less, Charles yielded his consent, even though he had promised Strafford that not a hair of his head should be harmed. Can we wonder at Strafford's bitter exclamation when he heard of the betrayal—"Put not your trust in princes!" So he was slain, and the king gave up to death his most faithful servant. And now there was none left who could save him from his own doom.

Yet because Strafford fell before his work was completed, he could not prevent the rebellion, and what he had done only made the Parliament the more afraid of what the king might do unless his power were bridled. So that, although Strafford did not live to see the rebellion himself, yet he was in great part the cause of it.

The archbishop who helped to bring about the revolution

Another man whose doings went far to rouse the anger of the people against the king and his ways was William Laud, who was Bishop of London and then became Archbishop of Canterbury.

Very many of the people at that time, throughout the country as well as in Parliament, were Puritans; that is, they were Protestants who had a great fear and hatred for the Roman Catholic Church, and were very ready to think that the clergy, and especially the bishops, meant to bring the country back to what they called Popery; and this they feared all the more because the king had married a French wife who was a Roman Catholic. But when they saw men like Laud set at the head of the clergy, they were the more angry and alarmed; because there were many practices and doctrines of the Roman Church which Laud taught and copied in the English Church, holding that this was what the English Church was meant to teach.

The two friends who ruled England sternly and were put to death

And, being archbishop, Laud forced the clergy, many of whom were willing enough, to follow these ideas, trying to make everyone go just in the way that he thought best, although there were many people whose consciences would not suffer them to do these things. And in these things the king gave him countenance, while both he and the clergy who agreed with him taught that the king ought to be obeyed in all things. So that the Puritans became very angry, and began to think that the governing of the English Church ought to be taken away from the bishops, and another plan followed which is called Presbyterianism; while others thought the

congregation of each church ought to have the right of choosing its own ministers and managing its own affairs.

And when they charged Strafford with treason, they charged Laud also; and him, too, they put to death, though not till some years later. Strafford and Laud had been great friends, and it was they two who gave the name of "Thorough" to the way of governing that they had practised. The picture on the next page shows us how, when Strafford was on his way to be executed, he passed by the window of Laud's prison, and kneeled down to receive the old archbishop's blessing.

JOHN PYM, WHO ROSE AGAINST THE MAN WHO HAD BEEN HIS FRIEND

We have seen how brave Sir John Eliot died in prison, and how Wentworth changed sides; now let us look at the third of those men who had done most to force King Charles to sign the Petition of Right. This was John Pym, a country gentleman who was also a lawyer. Now he, being a friend of both Eliot and of Wentworth, knew that when Wentworth joined the king's party he must thenceforth be reckoned the most dangerous and deadly foe of freedom. Therefore, when the Parliament met again after so long a time, as we have seen, it was John Pym who first ventured to rise up and attack the king, and who did everything in his power to bring about the destruction of the man who had once been his friend. It was Pym who most roused the people in the country, and whose words carried most weight in Parliament. He was the boldest as well as the shrewdest of all the Parliament men, and now there stood beside him one who was not, indeed, so skilled an orator, but who was not less honored for the nobility of his character, John Hampden.

JOHN PYM AND JOHN HAMPDEN LEAD THE NATION AGAINST THE KING

Now, these two had some ado both to give heart to those who feared the evils of a civil war more than they hated tyranny, and to restrain those who were too hasty to take thought quietly how best liberty might be secured.

But so great was Pym's influence, so mightily were men swayed by his words, that he came to be called King Pym by his opponents, in mockery, but in admiration by his friends. And those two, more than any others, the king himself sought to overthrow, so that one day he came suddenly down to the House of Parliament, where the Commons were sitting, having with him a band of soldiers, and willing there to arrest them with three others even in the Parliament itself. But they, having warning, had gone down the Thames by boat into the city of London, where they were too well loved for the king to dare attempt their capture. So Charles retired in dudgeon, and after that it was but a few months before there was open war between the army of the king and the army of the Parliament.

Now, when the war began, John Pym remained in London to direct the counsels of the Parliament, being already near sixty years old; and this he did with great wisdom and shrewdness until he died, about a year and a half after the war began. But John Hampden went at the head of a troop of horse which he had raised at his own cost, to be one of the leaders of the army of the Parliament in battle.

BRAVE JOHN HAMPDEN IS STRUCK DOWN BY A BULLET IN BATTLE

This was that John Hampden, of whom we have read on page 1038, who, when the king, ruling without Parliament, put an unlawful tax upon the people, refused to pay it, and was punished by the judges, who were afraid to give judgment against the king's will.

He was a man who tried always to do what he counted right, at whatever cost, so that even his foes honored him; and once it was said that it was only his coolness and wisdom which had restrained the king's party and the Parliament party within the House of Commons from falling upon each other even in the House itself. Therefore all men were grieved, even the king's men, who were now called Royalists or Cavaliers, when John Hampden was struck down by a bullet in the fight of Chalgrove Field; for they knew that when he died the chance was less than it had been that the two sides might yet find some way of agreement.

At the outset of the war, the greater part of the Parliament armies were made up of townsmen, who were brave enough,

but lacked skill in fighting; and their leaders were noblemen, who would have been willing enough to make peace with the king and their own friends who were fighting on his side. But on the king's side were most of the country gentry and their tenants, practised swordsmen and horsemen. And on that side the leader of the cavalry was Prince Rupert of the Rhine, son of the king's sister who had been wedded to the Elector Palatine. It was Rupert's nephew who, many years afterwards, was known as King George I. In many ways Rupert was a good soldier of a great courage; and when he led a charge of the Cavaliers, they were wont to be irresistible, sweeping all before them. But then the fiery Rupert often forgot that, when he had routed the ranks in front of him, it was time to halt his men and turn them against other of the enemy's troops; and his men would go on pursuing and slaying, or stopping to plunder. So that it happened many times that, when they got back to the field of battle, the rest of the "Roundhead" army, as the Parliament army came to be called, had beaten off the rest of the Royalists. But it was not till Oliver Cromwell had trained the troopers, who were called the Ironsides, that Rupert fairly met his match; for they charged each other in the great fight of Marston Moor, and Rupert's gallants were driven off the field.

ARCHBISHOP LAUD GIVING HIS LAST BLESSING TO STRAFFORD FROM HIS PRISON WINDOW

The Earl of Strafford and Archbishop Laud were great friends in their private lives, and colleagues in the government of England; and they ruled the people as with an iron hand. In the early days of Charles the First, when the voice of the people began to be heard, Charles, while he was still king, suffered them both to be charged with treason and put to death. Strafford died first, and this picture shows him on his way to execution, passing by the window of Laud's prison, kneeling down to receive the old archbishop's blessing.

But then Cromwell halted his men, and drew them together and came back, and fell upon the other part of the Royalist army which was pressing the Roundheads hard, and so won the first great victory for the Parliament. Yet after that, at Naseby fight, Rupert made his old mistake of charging on, after breaking the opposing line; and when he came back at last he found the whole of the Cavalier army scattered in utter rout. Afterwards, Rupert tried

STRAFFORD

LAUD

RUPERT

CAREY

MONTROSE

CHARLES THE FIRST

his hand as a sailor, and showed himself not less daring, and he also showed himself a keen student of science. He discovered a way of making drawings on metal by means of chemicals, so that a number of copies could be printed off, which is called mezzotint; and he is remembered for that, as well as for his fame as a dashing leader of cavalry.

But now let us look at two more Cavaliers. First see Lucius Carey, Lord Falkland. When first the Parliament met which was called the Long Parliament, he stood on the same side as Pym and Hampden, hoping that the king and the Parliament might both learn wisdom and come to agreement. But when he saw them growing month by month more bitterly at enmity, till the Parliament seemed to be grasping at the whole power, he went over to the king's side, fearing the tyranny of Parliament more than the tyranny of the king. He strove, however, to bring about peace between the two, though in that great crash of opposing wills there were none who would listen to counsels of gentleness. Therefore, in sadness of soul, Falkland chose loyalty before liberty; and when he was slain in battle, men said that he had died willingly.

The other is the hero of the Royalist cause in Scotland, James Graham of Montrose, whom men called the Great Marquis. Now he, like Falkland, was at the first on the side of the people against the king, but presently came to think that the leaders of the people would prove the more tyrannous of the two.

While in England the country was split in twain, in Scotland it seemed at first as if the king's cause were hopeless. Yet Montrose succeeded in gathering together some Highland clansmen; and so swiftly did he lead them from place to place, and so fierce was the onset of his men, that he won victory after victory over larger forces, and none could guess where he would strike his next blow. But at Philiphaugh his little army was shattered by a larger one under a skilful general, and so the Royalist cause was lost.

Nevertheless, when King Charles had been killed, Montrose made one more effort to win Scotland for Charles II. Once more, however, the odds against him were too great, and, wandering alone, he fell into the hands of an enemy whom he had counted a friend, and was tried for treason, and condemned to be hanged. But in all the war there was no leader more loved by his followers than the Great Marquis.

THE NEXT STORIES OF MEN AND WOMEN BEGIN ON PAGE 2013.

PYM

IRETON

HAMPDEN

ELIOT

BRADSHAW

OLIVER CROMWELL

CHRISTINA ROSSETTI'S FAMOUS POEM

CHRISTINA GEORGINA ROSSETTI, a famous poetess and sister of the more famous Dante Gabriel Rossetti, poet and painter, was born on December 5, 1830, in London, and died there, December 29, 1894. "Goblin Market," published in 1862, was her first long poem and many attempts have been made to explain its "inner meaning." But it is simply a charming fairy fancy and has no inner meaning. Among her many books of verse there is one purely for little folk, entitled "Sing Song."

CONTINUED FROM PAGE 1802

GOBLIN MARKET

MORNING and evening
Maids heard the goblins cry
"Come buy our orchard fruits
Come buy, come buy:
Apples and quinces,
Lemons and oranges,
Plump unpecked cherries,
Melons and raspberries,
Bloom-down-cheeked peaches,
Swart-headed mulberries,
Wild free-born cranberries,
Crab-apples, dewberries,
Pine-apples, blackberries,
Apricots, strawberries;—
All ripe together
In summer weather,—
Morns that pass by,
Fair eves that fly;
Come buy, come buy;
Our grapes fresh from the vine,
Pomegranates full and fine,
Dates and sharp bullaces,
Rare pears and greengages,
Damsons and bilberries,
Taste them and try:
Currants and gooseberries,
Bright-fire-like barberries,
Figs to fill your mouth,
Citrons from the South,
Sweet to tongue and sound to eye;
Come buy, come buy."

Evening by evening
Among the brookside rushes,
Laura bowed her head to hear,
Lizzie veiled her blushes;
Crouching close together
In the cooling weather,
With clasping arms and cautioning lips
With tingling cheeks and finger tips
"Lie close," Laura said,
Pricking up her golden head:
"We must not look at goblin men,
We must not buy their fruits;
Who knows upon what soil they fed
Their hungry thirsty roots?"
"Come buy," call the goblins,
Hobbling down the glen.
"Oh," cried Lizzie, "Laura, Laura,
You should not peep at goblin men!"
Lizzie covered up her eyes,
Covered close lest they should look;
Laura reared her glossy head,
And whispered like the restless brook:
"Look, Lizzie, look, Lizzie,
Down the glen tramp little men.
One hauls a basket,
One bears a plate,
One lugs a golden dish
Of many pounds weight.
How fair the vine must grow
Whose grapes are so luscious;
How warm the wind must blow
Through those fruit bushes."
"No," said Lizzie: "No, no, no;
Their offers should not charm us,
Their evil gifts would harm us."
She thrust a dimpled finger
In each ear, shut eyes and ran:
Curious Laura chose to linger
Wondering at each merchant man.
One had a cat's face,
One whisked a tail,
One tramped at a rat's pace,
One crawled like a snail,
One like a wombat prowled obtuse and furry,
One like a ratel tumbled hurry skurry.
She heard a voice like voice of doves
Cooing all together:
They sounded kind and full of loves
In the pleasant weather.

Laura stretched her gleaming neck
Like a rush-imbedded swan,
Like a lily from the beck,
Like a moonlit poplar branch,
Like a vessel at the launch
When its last restraint is gone.

Backwards up the mossy glen
Turned and trooped the goblin men
With their shrill repeated cry:
"Come buy, come buy."
When they reached where Laura was
They stood stock still upon the moss,
Leering at each other,
Brother with queer brother;
Signalling each other,
Brother with sly brother.
One set his basket down,
One reared his plate;
One began to weave a crown
Of tendrils, leaves, and rough nuts brown
(Men sell not such in any town);
One heaved the golden weight
Of dish and fruit to offer her:
"Come buy, come buy," was still their cry.
Laura stared, but did not stir,
Longed but had no money;
The whisk-tailed merchant bade her taste
In tones as smooth as honey,
The cat-faced purr'd,
The rat-paced spoke a word

1867

Of welcome, and the snail-paced even
was heard;
One parrot-voiced and jolly
Cried "Pretty Goblin" still for "Pretty
Polly";—
One whistled like a bird.

But sweet-tooth Laura spoke in haste,
"Good Folk, I have no coin;
To take were to purloin;
I have no copper in my purse,
I have no silver either,
And all my gold is on the furze
That shakes in windy weather
Above the rusty heather."
"You have much gold upon your head,"
They answered all together:
"Buy from us with a golden curl."
She clipped a precious golden lock,
She dropped a tear more rare than pearl,
Then sucked their fruit globes fair or red:
Sweeter than honey from the rock,
Stronger than man-rejoicing wine,
Clearer than water flowed that juice;
She never tasted such before,
How should it cloy with length of use?
She sucked and sucked and sucked the more
Fruits which that unknown orchard bore;
She sucked until her lips were sore;
Then flung the emptied rinds away,
But gathered up one kernel-stone,
And knew not was it night or day
As she turned home alone.

Lizzie met her at the gate
Full of wise upbraidings:
"Dear, you should not stay so late,
Twilight is not good for maidens;
Should not loiter in the glen
In the haunts of goblin men.
Do you not remember Jeanie,
How she met them in the moonlight,
Took their gifts both choice and many,
Ate their fruits and wore their flowers
Plucked from bowers
Where summer ripens at all hours?
But ever in the moonlight
She pined and pined away;
Sought them by night and day,
Found them no more, but dwindled
and grew grey;
Then fell with the first snow,
While to this day no grass will grow
Where she lies low;
I planted daisies there a year ago
That never blow.
You should not loiter so."
"Nay, hush," said Laura:
"Nay, hush, my sister:
I ate and ate my fill,
Yet my mouth waters still;
To-morrow night I will
Buy more;" and kissed her:
"Have done with sorrow;
I'll bring you plums to-morrow
Fresh on their mother twigs,
Cherries worth getting;
You cannot think what figs
My teeth have met in,
What melons icy-cold
Piled on a dish of gold
Too huge for me to hold,
What peaches with a velvet nap,
Pellucid grapes without one seed:
Odorous indeed must be the mead
Whereon they grow, and pure the wave
they drink
With lilies at the brink,
And sugar-sweet their sap."

Golden head by golden head,
Like two pigeons in one nest
Folded in each other's wings,
They lay down in their curtained bed:
Like two blossoms on one stem,
Like two flakes of new-fall'n snow,
Like two wands of ivory
Tipped with gold for awful kings.
Moon and stars gazed in at them,
Wind sang to them lullaby,
Lumbering owls forbore to fly,
Not a bat flapped to and fro
Round their rest:
Cheek to cheek and breast to breast
Locked together in one nest.

Early in the morning
When the first cock crowed his warning,
Neat like bees, as sweet and busy,
Laura rose with Lizzie:
Fetched in honey, milked the cows,
Aired and set to rights the house,
Kneaded cakes of whitest wheat,
Cakes for dainty mouths to eat,
Next churned butter, whipped up cream,
Fed their poultry, sat and sewed;
Talked as modest maidens should:
Lizzie with an open heart,
Laura in an absent dream,
One content, one sick in part;
One warbling for the mere bright day's
delight,
One longing for the night.

At length slow evening came:
They went with pitchers to the reedy brook;
Lizzie most placid in her look,
Laura most like a leaping flame.
They drew the gurgling water from its deep;
Lizzie plucked purple and rich golden flags,
Then turning homeward said: "The sunset
flushes
Those furthest loftiest crags;
Come, Laura, not another maiden lags,
No wilful squirrel wags,
The beasts and birds are fast asleep."
But Laura loitered still among the rushes
And said the bank was steep.

And said the hour was early still,
The dew not fall'n, the wind not chill;
Listening ever, but not catching
The customary cry,
"Come buy, come buy,"
With its iterated jingle
Of sugar-baited words:
Not for all her watching
Once discerning even one goblin
Racing, whisking, tumbling, hobbling;
Let alone the herds
That used to tramp along the glen,
In groups or single,
Of brisk fruit-merchant
men.

Till Lizzie urged: "O Laura, come;
I hear the fruit-call, but I dare not look!
You should not loiter longer at this brook:
Come with me home.
The stars rise, the moon bends her arc,
Each glowworm winks her spark,
Let us get home before the night grows dark;
For clouds may gather
Though this is summer weather,
Put out the lights and drench us through;
Then if we lost our way what should we do?"

Laura turned cold as stone
To find her sister heard that cry alone,
That goblin cry,
"Come buy our fruits, come buy."
Must she then buy no more such dainty fruit?
Must she no more such succous pasture find,
Gone deaf and blind?
Her tree of life drooped from the root:
She said not one word in her heart's sore ache;
But peering thro' the dimness, naught discerning,
Trudged home, her pitcher dripping all the way;
So crept to bed, and lay
Silent till Lizzie slept;
Then sat up in a passionate yearning,
And gnashed her teeth for baulked desire, and wept
As if her heart would break.

Day after day, night after night,
Laura kept watch in vain
In sullen silence of exceeding pain.
She never caught again the goblin cry:
"Come buy, come buy;"
She never spied the goblin men
Hawking their fruits along the glen:
But when the noon waxed bright
Her hair grew thin and grey;
She dwindled, as the fair full moon doth turn
To swift decay and burn
Her fire away.

One day remembering her kernel-stone
She set it by a wall that faced the south;
Dewed it with tears, hoped for a root.
Watched for a waxing shoot,
But there came none;
It never saw the sun,
It never felt the trickling moisture run:
While with sunk eyes and faded mouth
She dreamed of melons, as a traveller sees
False waves in desert drouth
With shade of leaf-crowned trees,
And burns the thirstier in the sandful breeze.

She no more swept the house,
Tended the fowls or cows,
Fetched honey, kneaded cakes of wheat,
Brought water from the brook;
But sat down listless in the chimney-nook
And would not eat.

Tender Lizzie could not bear
To watch her sister's cankerous care
Yet not to share.
She night and morning
Caught the goblin's cry:
"Come buy our orchard fruits,
Come buy, come buy:"

Beside the brook, along the glen,
She heard the tramp of goblin men,
The voice and stir
Poor Laura could not hear;
Longed to buy fruit to comfort her,
But feared to pay too dear.
She thought of Jeanie in her grave,
Who should have been a bride;
But who for joy brides hope to have
Fell sick and died
In her gay prime,
In earliest winter time,
With the first glazing rime,
With the first snow-fall of crisp winter time.
Till Laura dwindling
Seemed knocking at Death's door:
Then Lizzie weighed no more
Better and worse;
But put a silver penny in her purse,
Kissed Laura, crossed the heath with clumps of furze
At twilight, halted by the brook:
And for the first time in her life
Began to listen and look.

Laughed every goblin
When they spied her peeping:
Came towards her hobbling,
Flying, running, leaping,
Puffing and blowing,
Chuckling, clapping, crowing,
Clucking and gobbling,
Mopping and mowing,
Full of airs and graces,
Pulling wry faces,
Demure grimaces,
Cat-like and rat-like,
Ratel- and wombat-like,
Snail-paced in a hurry,
Parrot-voiced and whistler,
Helter skelter, hurry skurry,
Chattering like magpies,
Fluttering like pigeons,
Gliding like fishes—
Hugged her and kissed her;
Squeezed and caressed her.
Stretched up their dishes,
Panniers, and plates;
"Look at our apples
Russet and dun,
Bob at our cherries,
Bite at our peaches,
Citrons and dates,
Grapes for the asking,
Pears red with basking
Out in the sun,
Plums on their twigs;
Pluck them and suck them,
Pomegranates, figs."

"Good folk," said Lizzie,
Mindful of Jeanie;
"Give me much and many."

Held out her apron,
Tossed them her penny.
"Nay, take a seat with us,
Honour and eat with us,"
They answered grinning:
"Our feast is but beginning,
Night yet is early,

Warm and dew-pearly,
Wakeful and starry,
Such fruits as these
No man can carry;
Half their bloom would fly,
Half their dew would dry,
Half their flavour would pass by,
Sit down and feast with us,
Be welcome guest with us,
Cheer you and rest with us."
"Thank you," said Lizzie: "But one waits
At home alone for me.
So without further parleying,
If you will not sell me any
Of your fruits though much and many,
Give me back my silver penny
I tossed you for a fee."
They began to scratch their pates,
No longer wagging, purring,
But visibly demurring,
Grunting and snarling.
One called her proud,
Cross-grained, uncivil;
Their tones waxed loud,
Their looks were evil.
Lashing their tails
They trod and hustled her,
Elbowed and jostled her,
Clawed with their nails,
Barking, mewing, hissing, mocking,
Tore her gown and soiled her stocking,
Twitched her hair out by the roots,
Stamped upon her tender feet,
Held her hands and squeezed their fruits
Against her mouth to make her eat.

White and golden Lizzie stood,
Like a lily in a flood—
Like a rock of blue-veined stone
Lashed by tides obstreperously,
Like a beacon left alone
In a hoary roaring sea,
Sending up a golden fire,
Like a fruit-crowned orange-tree
White with blossoms honey-sweet
Sore beset by wasp and bee,
Like a royal virgin town
Topped with gilded dome and spire,
Close beleaguered by a fleet
Mad to tug her standard down.

One may lead a horse to water,
Twenty cannot make him drink.
Though the goblins cuffed and caught her,
Coaxed and fought her,
Bullied and besought her,
Scratched her, pinched her black as ink,
Kicked and knocked her,
Mauled and mocked her,
Lizzie uttered not a word;
Would not open lip from lip
Lest they should cram a mouthful in;
But laughed in heart to feel the drip
Of juice that syruped all her face,
And lodged in dimples of her chin,
And streaked her neck, which quaked like curd.
At last the evil people,
Worn out by her resistance,
Flung back her penny, kicked their fruit
Along whichever road they took,
Not leaving root or stone or shoot;
Some writhed into the ground,
Some dived into the brook
With ring and ripple,
Some scudded on the gale without a sound,
Some vanished in the distance.

In a smart, ache, tingle,
Lizzie went her way;
Knew not was it night or day;
Sprang up the bank, tore thro' the furze,
Threaded copse and dingle,
And heard her penny jingle
Bouncing in her purse—
Its bounce was music to her ear.
She ran and ran
As if she feared some goblin man
Dogged her with gibe or curse
Or something worse.
But not one goblin skurried after,
Nor was she pricked by fear;
The kind heart made her windy-paced
That urged her home quite out of breath with haste
And inward laughter.

She cried, "Laura," up the garden,
"Did you miss me?
Come and kiss me.
Never mind my bruises,
Hug me, kiss me, suck my juices
Squeezed from goblin fruits for you,
Goblin pulp and goblin dew.
Eat me, drink me, love me;
Laura, make much of me;
For your sake I have braved the glen
And had to do with goblin merchant men."

Laura started from her chair,
Flung her arms up in the air,
Clutched her hair.
"Lizzie, Lizzie, have you tasted
For my sake the fruit forbidden?
Must your light like mine be hidden,
Your young life like mine be wasted,
Undone in mine undoing,
And ruined in my ruin,
Thirsty, cankered, goblin-ridden?"
She clung about her sister,
Kissed and kissed and kissed her:
Tears once again
Refreshed her shrunken eyes,
Dropping like rain
After long sultry drouth;
Shaking with anguish, fear, and pain,
She kissed and kissed her with a hungry mouth.

Her lips began to scorch,
That juice was wormwood to her tongue,
She loathed the feast:
Writhing as one possessed she leaped and sung,
Rent all her robe, and wrung
Her hands in lamentable haste,
And beat her breast.
Her locks streamed like the torch
Borne by a racer at full speed,
Or like the mane of horses in their flight
Or like an eagle when she stems the light
Straight toward the sun,

Or like a caged thing freed,
Or like a flying flag when armies run,
Swift fire spread through her veins,
knocked at her heart,
Met the fire smouldering there
And overbore its lesser flame;
She gorged on bitterness without a name:
Ah! fool, to choose such part
Of soul-consuming care!
Sense failed in the mortal strife;
Like the watch-tower of a town
Which an earthquake shatters down,
Like a lightning-stricken mast,
Like a wind-uprooted tree
Spun about,
Like a foam-topped waterspout
Cast down headlong in the sea,
She fell at last;
Pleasure past and anguish past,
Is it death or is it life?

Life out of death.
The night long Lizzie watched by her,
Counted her pulse's flagging stir,
Felt for her breath,
Held water to her lips, and cooled her face
With tears and fanning leaves.
But when the first birds chirped about
their eaves,
And early reapers plodded to the place
Of golden sheaves,
And dew-wet grass
Bowed in the morning winds so brisk to pass,
And new buds with new day
Opened of cup-like lilies on the stream,

Laura awoke as from a dream,
Laughed in the innocent old way,
Hugged Lizzie but not twice or thrice;
Her gleaming locks showed not one
thread of grey,
Her breath was sweet as May
And light danced in her eyes.

Days, weeks, months, years
Afterwards, when both were wives
With children of their own;
Their mother-hearts beset with fears,
Their lives bound up in tender lives;
Laura would call the little ones
And tell them of her early prime,
Those pleasant days long gone
Of not-returning time,
Would talk about the haunted glen,
The wicked, quaint fruit-merchant men,
Their fruits like honey to the throat
But poison in the blood;
(Men sell not such in any town).
Would tell them how her sister stood
In deadly peril to do her good,
And win the fiery antidote:
Then joining hands to little hands
Would bid them cling together,
"For there is no friend like a
sister
In calm or stormy weather;
To cheer one on the tedious
way,
To fetch one if one goes astray,
To lift one if one totters down,
To strengthen whilst one stands."

SIR SIDNEY SMITH

This merry song about Sir Sidney Smith, one of England's naval heroes, was written by Thomas J. Dibdin, a son of the more famous Charles Dibdin, who wrote "Tom Bowling."

GENTLEFOLKS, in my time I've made
many a rhyme,
But the song I now trouble you with
Lays some claim to applause, and you'll grant
it because
The subject's Sir Sidney Smith, it is;
The subject's Sir Sidney Smith.

We all know Sir Sidney, a man of such
kidney,
He'd fight every foe he could meet;
Give him one ship or two, and without more
ado,
He'd engage if he met a whole fleet, he
would;
He'd engage if he met a whole fleet.

Thus he took, every day, all that came in his
way,
Till fortune, that changeable elf,
Order'd accidents so, that, while taking the
foe,
Sir Sidney got taken himself, he did;
Sir Sidney got taken himself.

His captors, right glad of the prize they now
had,
Rejected each offer we bid,
And swore he should stay, lock'd up till
doomsday,
But he swore he'd be hang'd if he did, he
did;
But he swore he'd be hang'd if he did.

So Sir Sid. got away, and his gaoler next day
Cried, "Sacre, diable, morbleu!
Mon prisonnier 'scape, I 'ave got in von
scrape,
And I fear I must run away, too, I must;
I fear I must run away, too."

THE RAINBOW

John Keble, the writer of this tiny but beautiful poem, was a celebrated poet and a clergyman. He lived from 1792 till 1866, and was professor of poetry at Oxford University, where Keble College was erected as a memorial to him.

A FRAGMENT of a rainbow bright
Through the moist air I see,
All dark and damp on yonder height,
All bright and clear to me.

An hour ago the storm was here,
The gleam was far behind,
So will our joys and grief appear,
When earth has ceased to blind.

Grief will be joy if on its edge
Fall soft that holiest ray,
Joy will be grief if no faint pledge
Be there of heavenly day.

BATTLE OF THE BALTIC

The battle of the Baltic was fought in April 1801, and the heroism of Nelson was the great feature of this famous sea-fight. Sir Hyde Parker commanded the English fleet, and Captain Edward Riou was killed while in command of a squadron. This stirring poem was written by Thomas Campbell.

OF Nelson and the North
Sing the glorious day's renown.
When to battle fierce came forth
All the might of Denmark's crown,
And her arms along the deep proudly shone;
By each gun the lighted brand
In a bold determined hand,
And the Prince of all the land
Led them on.

Like leviathans afloat
Lay their bulwarks on the brine;
While the sign of battle flew
On the lofty British line:
It was ten of April morn by the chime:
As they drifted on their path
There was silence deep as death;
And the boldest held his breath
For a time.

But the might of England flush'd
To anticipate the scene;
And her van the fleeter rush'd
O'er the deadly space between.
"Hearts of oak!" our captains cried, when each gun
From its adamantine lips
Spread a death-shade round the ships,
Like the hurricane eclipse
Of the sun.

Again! again! again!
And the havoc did not slack,
Till a feeble cheer the Dane
To our cheering sent us back;—
Their shots along the deep slowly boom:
Then ceased—and all is wail
As they strike the shatter'd sail;
Or in conflagration pale
Light the gloom.

Out spoke the victor then
As he hail'd them o'er the wave,
"Ye are brothers! ye are men!
And we conquer but to save:
So peace instead of death let us bring:
But yield, proud foe, thy fleet
With the crews, at England's feet,
And make submission meet
To our King."

Then Denmark blest our chief
That he gave her wounds repose;
And the sounds of joy and grief
From her people wildly rose,
As death withdrew his shades from the day:
While the sun look'd smiling bright
O'er a wide and woeful sight,
Where the fires of funeral light
Died away.

Now joy, old England, raise!
For the tidings of thy might,
By the festal cities' blaze,
Whilst the wine-cup shines in light;
And yet, amidst that joy and uproar
Let us think of them that sleep
Full many a fathom deep
By thy wild and stormy steep,
Elsinore!

Brave hearts! to Britain's pride
Once so faithful and so true,
On the deck of fame that died
With the gallant good Riou:
Soft sigh the winds of heaven o'er their grave!
While the billow mournful rolls,
And the mermaid's song condoles,
Singing, Glory to the souls
Of the brave!

LUCY GRAY

In this well-known ballad by William Wordsworth the awful sense of solitude and the terror of the dark days of winter on the lonely moors are suggested with the most dramatic effect, although it is written in a simple and direct manner.

OFT I had heard of Lucy Gray:
And, when I cross'd the wild,
I chanced to see at break of day
The solitary child.

No mate, no comrade Lucy knew;
She dwelt on a wide moor,
The sweetest thing that ever grew
Beside a human door!

You yet may spy the fawn at play,
The hare upon the green;
But the sweet face of Lucy Gray
Will never more be seen.

"To-night will be a stormy night—
You to the town must go;
And take a lantern, Child, to light
Your mother through the snow."

"That, Father, will I gladly do:
'Tis scarcely afternoon—
The minster-clock has just struck two,
And yonder is the moon!"

At this the father raised his hook,
And snapp'd a faggot band;
He plied his work;—and Lucy took
The lantern in her hand.

Not blither is the mountain roe:
With many a wanton stroke
Her feet disperse the powdery snow,
That rises up like smoke.

The storm came on before its time:
She wander'd up and down;
And many a hill did Lucy climb:
But never reach'd the town.

The wretched parents all that night
Went shouting far and wide;
But there was neither sound nor sight
To serve them for a guide.

At daybreak on a hill they stood
That overlook'd the moor;
And thence they saw the bridge of wood,
A furlong from their door.

They wept—and, turning homeward, cried:
"In heaven we all shall meet!"
When in the snow the mother spied
The print of Lucy's feet.

Then downwards from the steep hill's edge
They track'd the footmarks small;
And through the broken hawthorn hedge,
And by the long stone wall:

And then an open field they cross'd:
The marks were still the same;
They track'd them on, nor ever lost;
And to the bridge they came.

They follow'd from the snowy bank
Those footmarks, one by one,
Into the middle of the plank;
And further there were none!

Yet some maintain that to this day
She is a living child;
That you may see sweet Lucy Gray
Upon the lonesome wild.

O'er rough and smooth she trips along,
And never looks behind;
And sings a solitary song
That whistles in the wind.

BY THE SEA

The peace and tranquility of the sea, as well as its grandeur, are shown forth in this little selection from the beautiful poems of William Wordsworth, the English poet of nature.

IT is a beauteous evening, calm and free;
The holy time is quiet as a nun
Breathless with adoration; the broad sun
Is sinking down in its tranquility.

The gentleness of heaven is on the sea;
Listen! the mighty Being is awake,
And doth with his eternal motion make
A sound like thunder—everlastingly.

Dear child! dear girl! that walkest with me here,
If thou appear untouch'd by solemn thought
Thy nature is not therefore less divine.

Thou liest in Abraham's bosom all the year,
And worshipp'st at the temple's inner shrine,
God being with thee when we know it not.

SNOW-FLAKES

Henry Wadsworth Longfellow has written many beautiful poems, but none with a lighter touch than "Snow-Flakes." It makes us imagine that we actually feel the snow falling.

OUT of the bosom of the air,
Out of the cloud-folds of her garments shaken,
Over the woodlands brown and bare,
Over the harvest fields forsaken,
Silent and soft and slow,
Descends the snow.

Even as our cloudy fancies take
Suddenly shape in some divine expression,
Even as the troubled heart doth make
In the white countenance confession,
The troubled sky reveals
The grief it feels.

This is the poem of the air,
Slowly in silent syllables recorded;
This is the secret of despair,
Long in its cloudy bosom hoarded,
Now whispered and revealed
To wood and field.

GOD MOVES IN A MYSTERIOUS WAY

William Cowper wrote this beautiful hymn, which is sung in many churches. His wonderful genius speaks to us through this poem as through a number of his other works.

GOD moves in a mysterious way
His wonders to perform;
He plants His footsteps in the sea,
And rides upon the storm.

Deep in unfathomable mines
Of never-failing skill
He treasures up His bright designs,
And works His sovereign will.

Ye fearful saints, fresh courage take!
The clouds ye so much dread
Are big with mercy, and shall break
In blessings on your head.

Judge not the Lord by feeble sense,
But trust Him for His grace;
Behind a frowning providence
He hides a smiling face.

His purposes will ripen fast,
Unfolding every hour;
The bud may have a bitter taste,
But sweet will be the flower.

Blind unbelief is sure to err,
And scan His work in vain;
God is His own interpreter,
And He will make it plain.

ELEGY ON THE DEATH OF A MAD DOG

This amusing poem, by Oliver Goldsmith, is one of several that occur in the course of his famous story "The Vicar of Wakefield," and it serves to remind us that it is not always what we think is most likely to happen that comes to pass.

GOOD people all, of every sort,
Give ear unto my song;
And if you find it wondrous short
It cannot hold you long.

In Islington there was a Man,
Of whom the world might say,
That still a godly race he ran—
Whene'er he went to pray.

A kind and gentle heart he had,
To comfort friends and foes;
The naked every day he clad,—
When he put on his clothes.

And in that town a Dog was found,
As many dogs there be,
Both mongrel, puppy, whelp, and hound,
And curs of low degree.

This Dog and Man at first were friends;
But when a pique began,
The Dog, to gain some private ends,
Went mad, and bit the Man.

Around from all the neighbouring streets
The wondering neighbours ran,
And swore the Dog had lost his wits,
To bite so good a Man!

The wound it seem'd both sore and sad
To every Christian eye:
And while they swore the Dog was mad,
They swore the Man would die.

But soon a wonder came to light,
That show'd the rogues they lied:—
The Man recover'd of the bite,
The Dog it was that died!

NURSE'S SONG

William Blake proves in this little song how closely he must have observed the things he sings about so clearly. Notice the sixth line of the first verse, and look at what we have said in the note to Wordsworth's "Pet Lamb" on page 1925.

WHEN the voices of children are heard on the green,
And laughing is heard on the hill,
My heart is at rest within my breast,
And everything else is still.
Then come home, my children, the sun is gone down,
And the dews of night arise;
Come, come, leave off play, and let us away
Till the morning appears in the skies.

"No, no, let us play, for it is yet day,
And we cannot go to sleep;
Besides, in the sky the little birds fly,
And the hills are all covered with sheep."
Well, well, go and play till the light fades away,
And then go home to bed.—
The little ones leap'd, and shouted, and laugh'd;
And all the hills echoéd.

THE WORM

In the simplicity of the following little piece there is the very essence of Christian teaching, the poet who wrote it being famous as a philosopher and preacher. His name was Thomas Gisborne, and he was born in 1758 and died in 1846.

TURN, turn thy hasty foot aside,
Nor crush that helpless worm!
The frame thy wayward looks deride
Required a God to form.

The common lord of all that move,
From whom thy being flow'd,
A portion of His boundless love
On that poor worm bestow'd.

The sun, the moon, the stars, He made
For all His creatures free;
And spread o'er earth the grassy blade,
For worms as well as thee.

Let them enjoy their little day
Their humble bliss receive;
O! do not lightly take away
The life thou canst not give!

JOCK OF HAZELDEAN

This ballad by Sir Walter Scott has long been one of the most popular in Scotland, and tells of a country lass who preferred to run away with a poor man whom she loved, and to marry him rather than the rich bridegroom chosen for her. It contains many Scotch words, but they are easy to understand.

"WHY weep ye by the tide, ladie?
Why weep ye by the tide?
I'll wed ye to my youngest son,
And ye sall be his bride:
And ye sall be his bride, ladie,
Sae comely to be seen"—
But aye she loot the tears down fa'
For Jock of Hazeldean.

"Now let this wilfu' grief be done,
And dry that cheek so pale;
Young Frank is chief of Errington,
And lord of Langley-dale;
His step is first in peaceful ha',
His sword in battle keen"—
But aye she loot the tears down fa'
For Jock of Hazeldean.

"A chain of gold ye sall not lack,
Nor braid to bind your hair,
Nor mettled hound, nor managed hawk,
Nor palfrey fresh and fair;
And you the foremost o' them a'
Sall ride our forest-queen"—
But aye she loot the tears down fa'
For Jock of Hazeldean.

The kirk was deck'd at morning-tide,
The tapers glimmer'd fair;
The priest and bridegroom wait the bride,
And dame and knight are there:
They sought her baith by bower and ha';
The ladie was not seen!
She's o'er the Border, and awa'
Wi' Jock of Hazeldean.

THE ARMING OF PIGWIGGEN

Michael Drayton was one of the many poets who lived in the time of Queen Elizabeth. He wrote beautiful descriptions of English scenery and country life. One of his most remarkable works was a description of "The Court of Fairy," full of fancy and imagination. Pigwiggen was a fairy who was in love with Queen Mab, and in the following verses from Draytoa's long poem the arming of Pigwiggen is described.

HE quickly arms him for the field—
A little cockle-shell his shield,
Which he could very bravely wield,
Yet could it not be piercèd;
His spear a bent both stiff and strong,
And well near of two inches long;
The pile was of a horse-fly's tongue,
Whose sharpness naught reversèd.

And put him on a coat of mail,
Which was of a fish's scale,
That when his foe should him assail,
No point should be prevailing.
His rapier was a hornet's sting,
It was a very dangerous thing;
For if he chanced to hurt the king,
It would be long in healing.

His helmet was a beetle's head,
Most horrible and full of dread,
That able was to strike one dead,
Yet it did well become him;
And for a plume a horse's hair,
Which, being tossed up by the air,
Had force to strike his foe with fear,
And turn his weapon from him.

Himself he on an earwig set,
Yet scarce he on his back could get,
So oft and high he did curvet
Ere he himself could settle:
He made him turn, and stop, and bound,
To gallop and to trot the round,
He scarce could stand on any ground,
He was so full of mettle.

TRUE GROWTH

There is much wisdom compressed into these ten short lines of verse by the great Elizabethan poet Ben Jonson. The last line but one might also be applied to the little poem itself.

IT is not growing like a tree
In bulk, doth make Man better be;
Or standing long an oak, three hundred year,
To fall a log at last, dry, bald, and sere:
A lily of a day
Is fairer far in May,
Although it fall and die that night—
It was the plant and flower of Light!
In small proportions we just beauties see
And in short measures life may perfect be.

A CRADLE SONG

As we saw on page 1059, so great a poet as Lord Tennyson could devote his genius to the writing of a sweet little song for mothers to sing by baby's cradle. Here is another from his pen, pure and simple as baby itself. We should always bear in mind that a true poet does not despise the little things although he is able to write of the great ones.

WHAT does little birdie say
In her nest at peep of day?
Let me fly, says little birdie,
Mother, let me fly away.
Birdie, rest a little longer,
Till the little wings are stronger.
So she rests a little longer,
Then she flies away.

What does little baby say
In her bed at peep of day?
Baby says, like little birdie,
Let me rise and fly away.
Baby, sleep a little longer,
Till the little limbs are stronger,
If she sleeps a little longer,
Baby too shall fly away.

*THE TERRIBLE BALL

Mary Mapes Dodge is a clever American writer of children's stories and poems. This is one of her humorous story-poems, which behind its fun has a lesson for us in reminding us that a little mischief may grow bigger than was originally intended, and may ultimately get beyond our control. It is taken from her charming book "Rhymes and Jingles," by permission of Messrs. Charles Scribner's Sons, New York.

GIVE me your ear, good children all,
I'm going to set up a terrible ball—
A terrible ball that began to grow
From only the least little speck of snow.
And, to make the lesson pointed and plain,
I'll just remark that life, in the main,
Is, etcet'ra—you know; and I hope you'll be good
In future to show that you've understood.

Three lovely, little artless boys,
All of them being mothers' joys,
One day decided, in innocent mirth,
To make a snowball as big as the earth.
What makes the story more touching still,
The big-eyed schoolhouse on the hill
Was in session, under the cross Miss Stookey,
And these little boys were "playing hookey."
Hookey from Stookey, they worked with a will,
The ball grew bigger—and bigger still.

Then, like a pumpkin fair and round,
They kept it rolling on the ground—
Bigger, bigger, bigger, bigger,
Bigger, bigger, bigger, bigger!
The boys could hardly push it along,
It steadily grew so stout and strong.

Now, this mammoth ball, that began as a pill,
Was made, you must know, on top of a hill;
This hill was so terribly steep and high,
That even the coasters would pass it by;
And, saving a road by the cattle made,
It sloped right down, at a fearful grade,
To the meadow, where stood a cottage red
Where these little children were born and bred.

"Halloo!" they cried, "let's have some fun,
There's Stookey's pig as sure as a gun!"
"Hooray! hooray!" cried the children three,
Thus giving vent to their youthful glee.
When—what do you think?—this ungrateful pill,
That they'd made so big on top of the hill,
With an air that said, "Now, I think I've got 'em!"
Resolved to roll all the way to the bottom.

The ball was swift, the ball was big,
Alas for Stookey's innocent pig!
Alas for lovers who walked that way,
They ne'er in their lives forgot the day!
Alas for the learned Professor Gath,
Who happened to stroll in the snowball's path!
And alas, alas, for those children three,
Who shouted and cheered in their pretty glee!

Rolling, growing, demolishing all,
On and on went the terrible ball;
It left the cattle down on their knees,
It crushed the fences and bent the trees;
Even the haystacks went ker-flop.
It wouldn't turn, and it wouldn't stop,
But still rolled on in steady motion,
Making a bee-line for the ocean!

With laugh and shout and merry hoot,
Those children followed in glad pursuit.
"Hooray! hooray!" they cried again,
And then gave chase with might and main;
They gave it chase with main and might,
But the terrible ball rolled out of sight.

And now comes the saddest part of all.
(Oh, that cruel, wicked, terrible ball!)
When at last the three little artless boys,
Tired of running and making a noise,
All resolved to go home to bed,
Where, oh! where was that cottage red?
Where, oh! where? As the terrible ball—
Never a home had those children small.
Gone, clean gone! with picket and paling—
And all their joy was turned to wailing!

Moral

Hence it is, and so we see
Thus and so, it seems to me,
As I'm sure you'll all agree,
And ever after, better be.

SLEEP, BEAUTY BRIGHT

William Blake, the strange and mystic poet, as we have seen, could write simple lays of country life, and here we have him crooning a pretty little cradle song tender as a mother's, except that in the last lines he has a sudden fear for the dangers of life which the child, as it grows older, will have to face.

SLEEP, sleep, beauty bright,
Dreaming in the joys of night;
Sleep, sleep; in thy sleep
Little sorrows sit and weep.

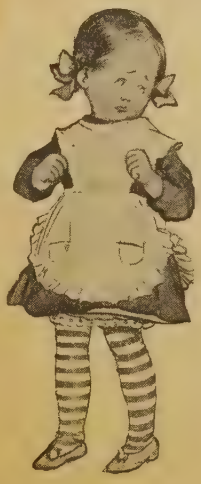
Sweet babe, in thy face
Soft desires I can trace,
Secret joys and secret smiles,
Little pretty infant wiles.

As thy softest limbs I feel,
Smiles as of the morning steal
O'er thy cheek, and o'er thy breast
Where thy little heart doth rest.

Oh, the cunning wiles that creep
In thy little heart asleep!
When thy little heart doth wake,
Then the dreadful light shall break.

*From "Rhymes and Jingles," copyright, 1874, 1904, by Charles Scribner's Sons.

LITTLE VERSES FOR VERY LITTLE PEOPLE



PEMMY was a pretty girl,
But Fanny was a better;
Pemmy look'd like any churl,
When little Fanny let her.

Pemmy had a pretty nose,
But Fanny had a better;
Pemmy oft would come to blows,
But Fanny would not let her.

Pemmy had a pretty doll,
But Fanny had a better;
Pemmy chattered like a poll,
When little Fanny let her.

Pemmy had a pretty song,
But Fanny had a better;
Pemmy would sing all day long,
But Fanny would not let her.

Pemmy loved a pretty lad,
And Fanny loved a better;
And Pemmy wanted for to wed,
But Fanny would not let her.

SBP

WHAT MAKES THE RAINBOW?

CONTINUED FROM 1796

THE rainbow is made by drops of rain; it is due to the reflection of sunlight from drops of water hanging in the sky. As the sunlight passes through the raindrop, and is reflected from the inside of the back of the raindrop, it is broken up into its various parts, which correspond to the various colors of the rainbow.

White light, we know, is a mixture of many colors. The light waves corresponding to these colors differ in the extent to which they are bent by passing through such a thing as a raindrop, and so, when they come out of it, they are sorted out, so to speak; and what was white light on going in, comes out as a band of several colors. Thus, what we see in the rainbow is really a natural spectrum of sunlight—the light spread out in a band of the various colors that make it up.

WHERE DOES THE RAINBOW END?

As we trace the rainbow down on each side it seems to touch the earth, and there are stories of children who have set out to find the end of the rainbow. But the rainbow ends nowhere, for it is a mere appearance in the sky, due to tiny drops of water, and it "ends," if we are to use that word, simply where the drops of water end that are so placed as to reflect the sunlight in this way to our eyes. Really no two people see exactly the same rainbow. They could not do so, unless their eyes were in the same place. And as we move, the bow we see moves with us.

WHY IS THE AIR FRESHER AFTER IT HAS BEEN RAINING?

There are several answers to this question. For one thing, the rain washes the air, as water will wash anything else. If the air has contained a number of smoke particles as it does in large cities, the rain has reduced their numbers by carrying them down with it as it fell through the air. Thus the rain helps to rid the air of the sulphurous and other gases which are given off by these smoke particles. Then again, it now seems that the falling of rain often, or always, depends in part on electrical charges in the air, and these charges may help to produce small quantities of the gas called ozone, a sort of variety of oxygen, which has a fresh smell of its own. Then, rain cleans the roads, and washes away all sorts of things which give off smells. We do not realize the extent to which rain is a cleanser in cities; and we must remember that our noses are usually only a few feet above the surface of the street, so that they are fully exposed to

whatever arises from them. A few hundred feet up, the air would smell very differently.

WHY DO THE FLOWERS SMELL SWEETER AFTER RAIN?

Where there is any vegetation rain has a great influence in making the air smell fresher, for water has a special power upon the activity of many kinds of vegetable life that produce pleasant scents. We say that the rain brings out the fragrance of the flowers, and that is true. All life requires water, and all the processes of living creatures are helped by a good supply of water. When rain falls on flowers, and on many kinds of leaves, it sets going the chemical changes which result in the production of many pleasant odors which are added to the air, and so help to make it smell "fresh." We often think that rain is a nuisance, for it interferes with many of our pleasures, and we tell it to "go to Spain," and "never come back again"; but if it took our advice we should soon have to go to Spain after it.

COULD WE LIVE WITHOUT RAIN?

I sometimes think, said the Wise Man, that it would be nice if all the rain could fall at night, for it is just as useful then, and interferes with few people; but, whether on holidays, or at night when we are all in bed and asleep, rain we certainly must have. The good of it is that it soaks into the soil and is sucked up by the roots of plants, which must have it if they are to live. If there were no rain there would be life only in the sea. In parts of the world where there is no rain there is no life. In this fortunate country we have no idea, just because we are so well off, how rain is loved and treasured and prayed for in other countries where there is not enough of it, or where it falls only at certain seasons of the year.

We "do not know when we are well off" in this country; and especially the people who live in towns, upon the food which is made in the country by the rain that falls there, do not know how good rain is, and how impossible our lives would be without it. We must think of rain, then, as something that cleans and washes the air, nourishes the vegetable life upon which our own life depends, and ensures a supply of fresh water all the year round in every part of the world where sufficient rain falls.

IS GREAT BRITAIN'S CLIMATE A GOOD ONE?

The climate of Great Britain is certainly not the worst in the world, although its people are always complaining of it. For one thing, they have a splendid supply of air-cleansing and life-giving rain, and can hardly guess what a famine of water means, or even that there could be such a thing. And the rain does not come all at one time of year, which in some parts of the world they call "the rainy season," interfering with everything when it comes, and then requiring to be stored up very laboriously until the next "rainy season"; but it comes in fair quantities all the year round.

IS THEIR WEATHER DUE TO THE FACT THAT THEY LIVE ON AN ISLAND?

The fine supply of rain that they have in Great Britain is due mainly to the fact that it is an island entirely surrounded by the sea, from which the sun can daily draw a supply of moisture to distribute over all the land, perhaps at once, perhaps a little later. The water surrounding the island not only supplies through the sun-power the rain that is needed, but its power of storing heat keeps the climate very equable, as it is called —or equal, as the word simply means.

In the summer the sea takes much heat from land and air, and so prevents the climate from getting so hot as to compel the people for several hours of every day having to stop work and stay indoors in discomfort; and in the winter the sea gives to air and land the heat of the past summer, and so prevents the climate from getting very cold. There are two great kinds of climates in the world, island or insular climates, and continental climates. The first are usually considered to be the best, for the reasons we have seen. Continental climates differ just because of the absence of the encircling sea and what it does for the land and air in winter and in summer.

WHY IS THE CENTRE OF A GAS-FLAME BLUE AND THE OUTSIDE YELLOW?

The color of a burning or a hot thing depends very largely on its temperature. A white-hot poker is hotter than a red-hot one; and a white-hot star like Sirius is hotter than a red-hot one like Aldebaran or the sun. The outside of a flame is very much hotter than the

inside, and gives out a brighter light in consequence—like a hot star or a hot poker. Also the metal sodium, when hot, gives a yellow color, and sodium is scattered everywhere. But the sodium in the gas is not hot enough to glow except in the outer part of the flame. If you have a carefully arranged flame, you may hold a match in the centre of it without the match taking fire.

Now you will ask me why the inside of the flame is colder than the outside, and the answer is easy. The outside of the flame is the part next the air—next the oxygen—which causes the burning. The inside of the flame has to be content with the very small amount of oxygen which gets to it, still unused, through the outer part of the flame. Where the burning is fastest and most complete, there the heat is greatest, and therefore the outside of the flame is hottest.

WHAT IS IT THAT HAPPENS WHEN WE GET TIRED?

The special word for feeling tired is *fatigue*, and this state of the body, as it often is, and of the mind, as it often is too, has been very carefully studied during the last few years, by many scientific men. We have learned a great many very interesting and useful things about it.

We know that the power and energy of the body come from our food; and so the first idea of the cause of tiredness or fatigue was that it was due to the need for more food. The tired person, people thought, had used up his food and needed more; just as a railway engine might be said to get "tired" if the fireman forgot to supply it with plenty of coal. If this were true, the more utterly exhausted and tired out a man was, the bigger the meal that he should take in order to make him feel fresh again.

But we have learned that this old idea was utterly wrong. The body always contains so large a supply of food material or fuel that a man gets tired, for some other reason, long before he has nearly used it up. Also we have learned that, in the state of fatigue, it is not possible to digest one's food properly, and therefore that to give a large meal to an exhausted person is very bad indeed for him. He is not fit to use it, and it only upsets him. We should eat only very slightly and carefully, if at all, when we are very tired. The best thing for fatigue is rest, and the best kind of rest is sleep.

WHY DO WE GET TIRED?

The answer is that weariness or fatigue is due wholly to the poisoning of the brain and the nerves by all sorts of things which are produced in our bodies as the result of work; or perhaps sometimes, as most children know, as the result of too much exposure to sun and heat.

Every day's work, if it is at all hard, produces rather more of these poisonous things than we can quite get rid of as we go on working; and these things really help us, at night, to go to sleep. During good sleep they are all got rid of, and we wake refreshed.

It is easy to show that this new discovery about tiredness is true. We can take a small quantity of blood from a tired animal, such as a dog, without hurting it, and can give this to another dog that is not tired. The second dog at once shows all the signs of a dog that has run a long way and is quite tired out. The poisons produced in the body of the first dog and carried in its blood have got into the blood of the second dog, and it, too, feels tired.

WHAT IS THE BEST CURE FOR TIREDNESS?

The answer to the last question guides us in answering this one. We must not take a large meal when we are tired, because we are not then fit to deal with food. We may take water, or lemonade, or oranges, because water, in passing through the body, always carries all sorts of poisons away with it and helps us to get rid of them.

But, above all, we must rest, and there is no kind of rest which can be compared with sleep. In general, the people who sleep best are those who work hard. The man who works all day in the fields usually has the best sleep in the world, far better than some unfortunate people who do very little or nothing, and who may even take medicine to help them to sleep. Nature, the best of all doctors, has her own medicine to procure good sleep for every healthy person who works; and the most beautiful thing about tiredness, when it is the right, "nice" tiredness that everyone should feel when he goes to bed, is that it produces in our blood just the very thing that gives us perfect and natural sleep. Perhaps we shall soon be able to find this thing, and learn how to make it. Then we shall be

able to give just the right quantities of it to make ill people well.

WHAT MAKES THE SHADOWS THAT GO UP AND DOWN HILLS?

The shadows that we see crossing the face of the hills are the shadows of clouds. They can be seen passing over the sea, too, or running across the field of play when you watch a game of baseball. They are best seen when there are small clouds quickly moving, and with well-marked edges, passing across the sun, as it seems to us, on a bright day. Sometimes they move more quickly than at other times. This depends partly on the wind, which varies very much in speed, and on the height of the clouds. Often, if you watch these shadows, you can see the whole shape of a cloud that makes one, and, of course, often such a shadow passes where we are standing.

WHAT IS THE BIGGEST SHADOW THAT WE CAN SEE?

There is one great shadow, thousands and thousands of times bigger than any other, which men have noticed at times in all ages, and which has often made them very much afraid. This is the shadow of the earth itself, and it is thrown upon the moon. It sometimes happens that the earth just gets in the way of the light from the sun which would fall upon the moon if the earth were not there. And so we get what we call an eclipse of the moon. As we watch the moon, we can see a round shadow beginning to creep across it.

Sometimes it passes over only part of the moon; sometimes it covers the whole moon for a little while, and we call that a total eclipse of the moon. When we watch this shadow—one does not even need a glass to see it with—it is easy to see that the shadow is curved. It is the shadow of a round thing, and this is one of the proofs that the earth is really round. In olden days men used to be very much afraid of eclipses of the moon and of the sun. They used to think that it was a warning of something awful that was to happen. But

THE SHADOW OF THE MOON BLOTTING OUT THE FACE OF THE SUN

This is one of the most impressive sights that men have ever seen—the moon passing across the face of the sun. It happens sometimes that the moon gets directly in the way of the sunlight which would fall upon the earth if the moon were not there, and we call this an eclipse, or covering up, of the sun.

now we know that an eclipse of the moon is nothing more than just the throwing of a great shadow upon the moon's face, and that is the shadow of the earth, by far the greatest shadow that anyone can ever see.

WHAT MAKES AN ECLIPSE OF THE SUN?

The kind of eclipse that used to frighten people most is an eclipse of the sun. It does not often happen that the sun is totally eclipsed, but when this does happen on a bright day the effect is very wonderful. It suddenly becomes dark, until it is like night; it turns cold; the dew falls; the birds go to roost; the flowers go to sleep; all this, perhaps, in the middle of the day, and with not a cloud in the sky. Then, just as suddenly the daylight all comes back again. An eclipse of the sun is not due to a shadow, but happens when the moon gets between the earth and the sun, and we see the moon pass across the sun.

This happens quite often, but it is not often that the moon passes across in such a way that, for a little while, it exactly fits over the sun, and cuts off all his light. Those are the startling times. We know beforehand when they are to happen, and to what parts of the world we must go to see them, and exactly how long the period of real darkness will last. Great preparations are made, and men go with telescopes and cameras and all sorts of other instruments, perhaps to Greenland, perhaps to some tiny island in the Pacific Ocean, just for the sake of the forty seconds, or perhaps it may be as much as four minutes, during which the moon will exactly fit over the face of the sun. For we can see things and learn things about the sun during those few seconds as we never can at any other time.

WHAT IS THE MILKY WAY?

Students of the stars think that the Milky Way is the boundary of our world of stars. It is a complete closed circle where the sky is crammed with stars; yet in places there are gaps where we can see through beyond into nothing. We can begin to measure the diameter of this great circle. Our own sun and his system seem to be somewhere near the centre of it, and a very remarkable thing about the sun, and therefore about us, seems to be that he is very much alone in the world of stars. He has no near star neighbor, while most of the other stars are much more neighborly, especially throughout the whole circle of the Milky Way. We cannot tell at all whether the whole Milky Way is moving through space, and we do not know whether it is moving round on itself; but we can study and photograph it now, and long years afterwards our successors may compare our photographs with what they then see, and may be able to learn about these things.

IS IT POSSIBLE THAT THE MILKY WAY WILL TURN INTO A WORLD?

Look closely at the Milky Way on a bright night, and you will see that it is made of many stars, only they seem so closely packed together that their light is all blended, looking like a thin cloud or a milky streak spread across the sky. If you use an opera-glass or a telescope, you see the separate stars more clearly, and if you take a photograph through a telescope — which is quite an easy thing to do — you find that the stars of the Milky Way are to be counted not in thousands, or even in hundreds of thousands, but actually by the million.

From any one part of the earth we can only see about half of the Milky Way, but this great streak of stars really forms a mighty circle, the different parts of which can be seen from different parts of the earth. The sun and the earth and other planets with it lie somewhere not very far from the centre of this great circle. Now, every one of these millions of stars is a sun like ours, only some are smaller than our sun, and many are far bigger. Any or all of these suns, for all we know, may have one or many planets circling round it, just as the earth moves round the sun. We cannot see these planets, for they must be too small, and without any light of their own, just as the earth is. So that if we were to allow only two or three planets to every star or sun that makes up the Milky Way, that would mean hundreds of millions of worlds, large and small, old and young.

WHAT ARE THE STREAKS OF LIGHT THAT SOMETIMES SHOOT ACROSS THE SKY?

These are called shooting stars. Of course, they are not stars, any more than a speck of dust or a coal-scuttle is a star. They are quite small things, often just like stones, though some of

them are made of iron. They look bright merely because, as they rush through the air, they get very hot. The smaller ones, no doubt, get so hot that as they pass through the air they burn all away, just as a candle does, and so they never reach the earth at all. But bigger ones actually reach the earth, sometimes making big holes where they fall. You may have seen such things in museums, and you can look upon few things more interesting if you think of their history, for in the beginning these things did not belong to the earth at all; only they were rushing through space, many parts of which contain large numbers of things like pebbles, and they got caught by the air of the earth and the earth's gravitation.

Many of these meteorites, as they are called, are believed to have once been part of the bright things called comets. Sometimes an accident seems to happen to a comet and breaks it up, and in the path where this comet used to travel round the sun there is, instead, a great shoal of meteorites. When the earth, in her path, happens to cross the path of the meteorites, many of them will be caught, especially if it be just at the time when the thickest part of the shoal is passing. So we know the times of the year and the special years when we may expect to see a large number of streaks of light in the sky at night, as seen in the picture on page 143. The best showers of shooting stars are usually seen in November, when the earth crosses the path of a shoal of meteorites called the Leonids.

WHY DOES THE SEA LOOK SOMETIMES BLUE AND SOMETIMES GREEN?

You might have added, said the Wise Man, why does it look sometimes black and sometimes grey? On a black night, when there is no light for the sea to reflect, the sea looks black. When the sky is grey, the sea reflects the light that falls upon it, and looks grey. The color we usually think of as the color of the sea is blue, because the sky is blue, or ought to be; and if it be blue light that falls upon it, it is blue light that the sea reflects.

Yet sometimes the sea is green, though the sky is never green. Parts of the sea are shallow, especially near the shore, and may be so shallow that some of the light from the sky may pierce the water, reach the bottom, and be reflected from it to our eyes. So, of course, the light will be changed, partly according to the color of the bottom of the sea, and partly because of the greenish tinge of sea-water itself. Besides all this, we have to remember that the same part of the sea on a coast we know well may be of a different color on different days, even though the water is the same and the color of the bottom is the same, because the sun is in a different part of the sky, and so the light strikes the bottom differently, or because the sky is clouded, and so the light which reaches the sea from the sky is different. Thus, there are many different things which will affect the color of the sea, and that is why its color changes so much and is so beautiful to see.

HOW CAN THEY CATCH BURGLARS BY THEIR FINGER-MARKS?

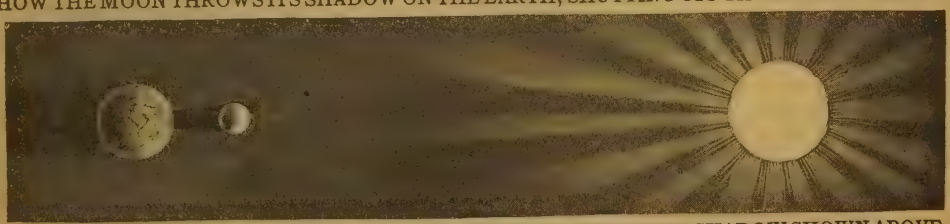
You have heard, perhaps, that nowadays burglars wear gloves in order to avoid leaving their finger-marks on a window-pane or anywhere else. The fact is that all men and women differ from each other in little things, and there is nothing in which they differ more certainly than the pattern of the little ridges on their fingers. Two patterns exactly the same from two different people have never yet been found. These patterns cannot change, for they are formed by the innumerable mouths of the tiny canals which convey the sweat from the deep-seated sweat-glands to the surface. They can be destroyed, of course, but no different pattern can be put in their place.

Thus, of all the ways of knowing who is who, this is the most certain, as well as much the simplest and cheapest. It is now being more and more used. If

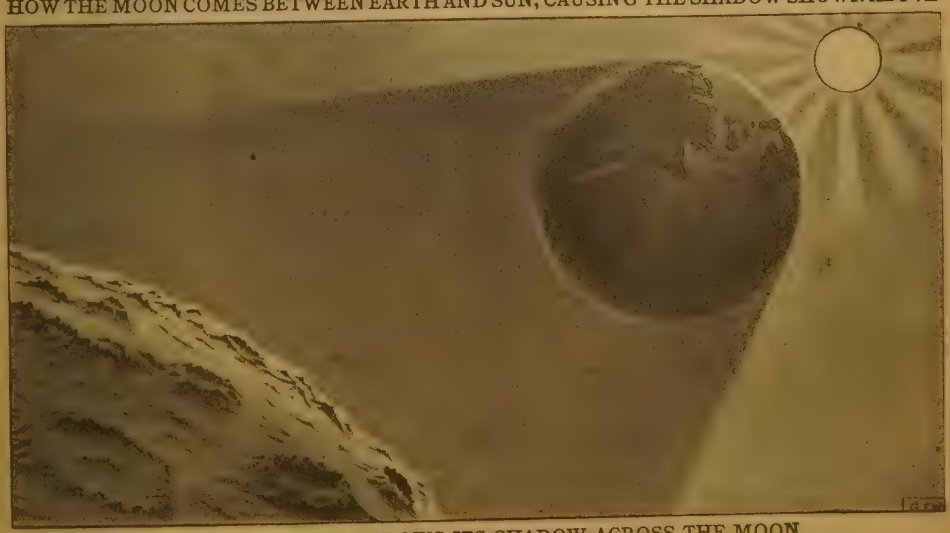
These are the marks of men's fingers on things they have touched. Finger-prints like these help the police to catch burglars. No two finger-prints from different people have ever yet been found to be alike.

THE SHADOW OF THE WORLD

HOW THE MOON THROWS ITS SHADOW ON THE EARTH, SHUTTING OFF THE LIGHT OF THE SUN



HOW THE MOON COMES BETWEEN EARTH AND SUN, CAUSING THE SHADOW SHOWN ABOVE



HOW THE EARTH THROWS ITS SHADOW ACROSS THE MOON

We have all seen our shadows on the ground, but there is one great shadow that not all of us have seen. That is the shadow of the whole world. On its way through space the moon passes sometimes between the sun and the earth, shutting off the sunlight from the earth, as shown in the top picture. The middle drawing shows that the moon does not hide the sunlight from the whole of the earth, but only from a part of it, and the moon's shadow makes day so dark in that part that we can see the stars. We call this an eclipse of the sun. Sometimes, too, the earth passes between the moon and the sun so as to cut off all sunlight from the moon, as shown in the bottom picture, and the shadow thrown by the earth upon the moon is about 240,000 miles long—long enough to reach thirty times across the earth. We call this an eclipse of the moon.

a man's thumb-mark is the same as the mark on a piece of paper where a theft was committed, the evidence against him is very strong. A bad man who has become known to the police may change his clothes and the appearance of his face, he may look like a different person, and have not the slightest resemblance to the photograph taken of him, but his thumb-mark will tell him at once.

WHY DO SOME FACES IN PICTURES SEEM TO FOLLOW US?

It is clever to have noticed this, and perhaps you have also noticed that in other pictures there are faces which are not looking at us; but no matter where you walk, even though it be in the direction in which they seem to be looking, you will never find the face looking at you. Indeed, faces in pictures are either looking at us, from wherever we look at them from, or else they are never looking at us, wherever we look at them from. The same is true of photographs.

These eyes seem to follow you everywhere; they look at you in any direction. That is because they were fixed on the painter when he was at work, as explained on this page.

The rule is very simple. If the person who was being painted or photographed were looking at the painter or at the camera, then, wherever you stand, he will seem to be looking at you. If he were looking on one side, then, wherever you stand, the effect is that he seems to be looking on that side of you. This works very queerly if you have a group of people who were all looking at the camera at the moment when they were being photographed. If you look at the photograph from one side, they all seem to turn to follow you, and then to turn back if you look at it from the other side. But if they were not looking at the camera, you can never get them to look at you.

WHY DOES THE SMOKE OF A TRAIN GO THE OTHER WAY?

When the smoke leaves the funnel of the engine it is really moving forward, like the engine itself, and at exactly the same rate. If we could imagine that the train was moving onwards in *nothing*, then, since we know that moving things always move on in a straight line at the same speed for ever, unless something outside affects them, the smoke would move forward with the train, and would actually pass on in front of it so soon as the driver slowed the train. But the smoke, we know, is really poured into the ocean of air through which the train is pushing its way. The air tends to stop the train, as it tends to stop everything that moves through it, and every engineer knows how important this air-pressure is; but though it retards the train a good deal, it retards the light, hot smoke that is poured into it far more. The question reminds us that the smoke seems to *go* in the opposite direction to the train; but really it simply moves forward so slowly and for such a little distance that, compared with the train, it seems to go the other way.

But if a strong wind is blowing in the same direction as the train—and perhaps this is oftenest seen in the case of the smoke from a ship's funnel—then the smoke is blown forward by the wind far in front of the train or ship. In this case and the last the same principle works, though the results are so different. The principle is that the air affects the smoke more than the train or ship. In one case it holds both back, but it holds the smoke back most; in the other case

it blows both forward, but the smoke most.

Are all animals born blind?

It is not quite true that all animals are born blind, but it is quite true that most of the mammals, when they are newly born, do not at once begin to use their eyes to see. The eyes themselves are there, however, quite fully developed and all ready to be used for seeing as soon as they have become accustomed to the strong light. The young of wild animals are born in a nest or a lair selected by the mother, and this is generally placed in some dark and secluded place to which very little light gains access. There would be no object in the young opening their eyes widely to the full glare of the sun's rays before they are able to move about, because most young mammals are very helpless at birth, and have to lie still in their nests until they have grown strong enough to be able to look after themselves. By that time they have got used to a certain amount of light. They can open and shut their eyes, and when they begin to move and gradually come into light, the eyes also gradually become used to that light. So that really they are perfectly able to see at the time that they require their sight either to obtain their food or to guide their footsteps.

Of what does the hen make her eggs?

All birds lay eggs, but what we commonly call a hen's egg, with its shell, consists of a good deal more than the real egg, which is the growing part of a chicken. In fact, most of the hen's egg is made of substance secreted by a special organ in the body for the purpose of nourishing the growing chicken within. This nourishing material is what we call the yolk. It is made, of course, from the food upon which the hen feeds, which becomes changed by digestion, and is carried through the hen's body by the blood. Then, in a special part of the body, the proper elements are taken from the blood and made into the yolk, upon which the growing chick feeds. The whole thing is then covered with a shell, which is also secreted from the things upon which the hen feeds.

Why does a bad egg float, seeing that a good egg sinks?

A fresh hen's egg consists of a mass of yolk, together with what we call the white of the egg, and this, being heavier than water, will cause the egg to sink when it is placed in water. But in an egg which has become addled or rotten, the yolk and white have split up into other things, and produce gases which escape and the egg becomes lighter than it was before. In fact, such an egg does not weigh as much as an equal bulk of water does, so that if placed in water it will float and not sink.

Why does an owl come out only at night?

Quite a number of animals, and some other birds besides owls, are *nocturnal* in their habits — that is to say, they are adapted for living their lives generally during the hours of night. If we want to understand why an animal comes out at night, or why it comes out in the daytime, we must, as a rule, ask ourselves: What is it that makes an animal active at one time of the day rather than at another? The answer to this question is generally to be found in the search for food. So it is in the case of the owls. Owls feed chiefly upon mice and other small creatures that are active during the hours of the night, and so the owl, with its peculiar noiseless flight, due to the fact that its plumage is so soft, comes out at night in search of food. It is because of this habit that the pupils of the owl's eyes are adapted for seeing at night, being made to open very widely to catch every ray of light that there may be, and so see where other animals would be unable to see.

Can a fish hear?

Although fishes are like some other animals in having no visible signs of ears, yet they have ears which conduct sound to the brain. Their organ of hearing consists simply of an internal ear placed inside a gristly capsule. In some fishes — as, for instance, the dog-fish — there is a fold known as the *false gill*, which is no doubt the remains of a real gill, but is now used for transmitting sounds to the internal ear. In the wall of the capsule which contains the internal ear there is a thin spot, and it is through this thin part, corresponding with what we call the drum of our own ear, that the sound is conducted. Thus, we see that in the case of some of the fishes there has been a change of function of an organ which was

in the first place a gill, but has now become part of the hearing apparatus. In other words, it is a structure at one time used for breathing, but now used for hearing.

How is it that fishes do not drown?

All animals and plants must get air in some way or other in order to live; or, to be more strictly accurate, they must have a supply of oxygen, which is one of the gases in the air. Should this supply of oxygen fail, death must come, no matter whether it be from drowning or from any other cause. When a man is drowned, what really happens is that, on account of his being so long under the water, his supply of life-giving oxygen has run short, and as he can only get it when he is in the air, he dies.

But this is not because there is no oxygen to be had in the water, for, as a matter of fact, there is quite a large amount of this life-giving gas dissolved in water, only human beings and animals breathing by lungs cannot make use of it. Their organs are only adapted for breathing air. The fishes, on the other hand, breathe by gills, not lungs, and the wonderful way in which gills are made enables them to extract the oxygen from the water. Being able to do this, they can live under water perfectly well. But if anything should happen to prevent the fish from getting oxygen from the water, or if anything should happen to the water to deprive it of its oxygen, then the fish would be drowned, as would any other animal.

What part of ourselves do we lose when we lose our balance?

You have probably imagined that we stand entirely with the help of our feet, but that is quite wrong. We are supposed to be able to balance ourselves, when standing, largely by means of some very complicated structures in connection with the ear. These are three little canals which lie in different directions, and are filled with fluid. These canals communicate by nerves with various parts of the brain. It has been suggested that if a person suddenly turns round, or spins round, the fluid in these canals partakes of the movement, and so gives us the sensation of turning round even when we stop. If this be true it would explain why we feel giddy and lose our balance even though we are no longer turning. But there are other causes that make us feel giddy and lose our balance, some of which men have not yet been able to properly understand, and the details of which are much too difficult for us to enter upon here.

What changes the way of the wind?

Like almost everything else, the air is always moving, more or less, and the changes in the direction of its movements are due to many different things. There is, for instance, the movement of the earth on itself, and also its changing position in regard to the sun as it goes round the sun. These movements mean that different parts of the earth are exposed to the sun at different times; and that means, of course, that different parts of the air are exposed to the sun at different times. When the sun shines on the air it makes it warm, and warm air is lighter than cold air, and will rise, while cold air will flow in to take its place.

But there is a great deal more in it than this. Besides the fact that the surface of the earth is not smooth, but has mountains and hills that turn the wind as the earth turns, and tracts of water which cool hot air as it passes over them, there are all sorts of electrical changes always going on in the air, and these probably affect its weight — perhaps even the proportions of the various gases in it—even as much as the heat of the sun affects it. You can scarcely ask more difficult questions than these about wind, rain, and weather.

Why do the telegraph lines hum?

Anything that is stretched is apt to be thrown into vibration, or made to tremble, by the force of the air blowing against it. If it vibrates so fast as to produce the air-waves that our ears can hear, then that is what we call sound. This is what happens to the telegraph wires when they hum; and if we put our hand on the telegraph pole we shall feel that the wires vibrate strongly enough to set the whole pole trembling, too. If we think of the way in which our own voices are produced we shall see that the telegraph lines hum in exactly the same way as we hum ourselves. Something stretched, in each case, is made to tremble. When the air is quite still, you will not hear the telegraph lines humming.

THE NEXT QUESTIONS BEGIN ON PAGE 2005.

WHAT THIS STORY TELLS US

WE have learned about the principal compounds, and the way they are related; here we learn about some wonderful mixtures of metals called alloys, which are as interesting and valuable as if they were really new compounds. Then we conclude our study of chemistry by looking at a few of the principal compounds of carbon, which are found everywhere in the world of life. We learn how these compounds run in long series, so that we can foretell what they will be, and what properties they must have, even before we find them. We learn in these pages, also, about the alcohols, especially the particular alcohol that people drink, about ferments and fermentation, and about the way in which alcohol and bread are made by ferments. After this we must leave the study of chemistry for the present, and go on to the study of the stars. We shall see that they have their chemistry, too.

CHANGES ALWAYS GOING ON

THE CHEMISTRY OF ALL LIFE AND LIVING THINGS

CONTINUED FROM 1817

THIS is the last part of our book in which we shall have space to learn about chemistry, though in other parts of the book we shall find that chemistry turns up again and again. So here we must go on to look at some of the important compounds that are found in the world of life especially.

Hitherto we have been dealing mainly with what is called inorganic chemistry—the chemistry that does not have to do with living organisms or living creatures. But in the world of life we find a wonderful realm of chemistry, which we have really only just begun to explore, and we find that the compounds contained in it are compounds of the familiar element carbon, which is interesting in charcoal and in diamonds, and in lead pencils, but a thousand times more interesting in ourselves and in all living creatures.

We have already seen some compounds of carbon, such as carbon dioxide and calcium carbonate. These are very simple, but carbon forms hundreds of thousands of other compounds, some of them having hundreds of atoms in the molecule, and the *chemistry of the carbon compounds* is the name now given to what used to be called organic chemistry.

This new chemistry has all the same laws and principles as that about which we have learned hitherto. The laws of atoms and molecules, the laws of elements and compounds, and of oxidation and decomposition, and of chemical equations, and so on, are true everywhere, or they would not be worth discussing. They are true in a fire or in our bodies, true on the earth or in the sun—for Nature is a mighty whole, and is consistent in all her workings.

But just before we go on to this last division of chemistry, a word must be said regarding some very interesting and valuable chemical substances, not compounds, yet not elements, which play a great part in modern life. We know that when we make the elements combine with each other we get new substances, very different from those we started with. Now, in some cases it is sufficient merely to get certain elements to mix with each other in order to get things which differ a good deal from any of the elements contained in them.

The greatest instance we know of this is, of course, steel, which is one of the pillars of life as men live it now, and which we get by mixing, but not chemically combining, iron and carbon. And here may be mentioned a few other mixtures which have special names. There are, for instance, one or two mixtures of mercury with other elements, such as the mixture of sodium and mercury. The name for these mixtures of mer-

cury is *amalgams* and you may have seen a word like this; for sometimes we say that when, for instance, two firms or two societies have joined together, they have *amalgamated*. But, apart from the amalgams, there is a special name for mixtures of metals which can be mixed together when they are melted and remain mixed when they turn solid. These mixtures are called *alloys*. When we want to say that a thing has been very good, with nothing to say against it, we say that it was "without alloy," or "unalloyed." Thus we speak of "unalloyed pleasure." When we say this, we are really comparing the thing to *pure* gold, which has not been alloyed with any "base" metal, such as copper. For our gold coins we use an alloy of nine parts of gold to one of copper, because the copper makes the gold harder. And, similarly, we use the same proportion of copper for silver coins. When we say a ring or an ornament is 14 or 18 carat gold, we show the proportion between the gold and its alloy. Twenty-four carats make an ounce, and 18 carat gold is gold eighteen-twenty-fourths pure.

THE MIXTURES OF METALS CALLED ALLOYS, AND THEIR GREAT USEFULNESS

Much the most generally useful alloy is brass — an alloy of copper and zinc. Common brass has about 70 per cent. of copper and 30 per cent. of zinc. An alloy of the three metals zinc, copper, and nickel is called "German silver." There is no silver in it. Tin and lead alloy to form "solder," and when the proportion of lead is a good deal higher, they alloy to form "pewter." Tin and copper alloy to form "bronze"— a fine substance for casting statues in — and the words on this page are printed with an alloy of lead and antimony, which is called "type-metal."

No one can yet explain why alloys should differ in many of their properties so markedly from the metals that make them; and we find in some cases that even the tiniest proportion of some new metal added to an alloy will increase its strength, for instance, enormously. Especially does this apply to steel. Metals, such as chromium and manganese, alloyed with iron, when it is made into steel with carbon, add to its usefulness so much that the older kinds of steel are now made only for the commonest purposes. This branch of study has scarcely been more than begun as yet, but it is plain that we shall learn how, by means of suitable alloys, to get materials which will do almost anything we require of them, not only in the case of steel, but in many others. For instance, we may find an alloy which has the strength of steel but only a fraction of the weight of steel, and so may solve one of the great difficulties in the way of making flying machines.

THE SPECIAL INTEREST OF THE CHEMISTRY OF THE CARBON COMPOUNDS

Now we must pass from these very curious mixtures of elements, in which their proportions may be varied indefinitely, to look at the chemistry of the carbon compounds; and here we find the strictest regularity in the way in which these compounds are made. Quite apart from their enormous importance in the world of life, it is this regularity of composition that makes them so interesting to the chemist. They seem all to be built on certain simple models; and from each of these models we find long series of compounds formed. For instance, there is a compound called marsh-gas, which has the formula CH_4. Then we find, derived from it, a long series of compounds of which each has one atom of carbon and two atoms of hydrogen more than the one before in the list. Thus, after CH_4, we have C_2H_6, C_3H_8, C_4H_{10}, C_5H_{12}, and so on. In this part of chemistry there are dozens of series like this, where the molecules seem to be built up of little groups of atoms twice, thrice, and so on repeated. and a specially interesting thing is that all the properties of these compounds vary in a regular way, according to their construction. As we pass along such a series, we find, for instance, that each member of it boils at a higher temperature than the last.

THE MAKING OF CHLOROFORM, WHICH HAS SAVED MILLIONS OF PEOPLE FROM PAIN

Marsh-gas, CH_4, is called a hydrocarbon, because it contains hydrogen and carbon. We know any number of these hydro-carbons which occur in Nature, and we can make many more. Also we can make new compounds from them by exchanging certain of their atoms for other atoms. A celebrated instance of this was the making of chloroform. We can take marsh-gas,

CH_4, and can substitute an atom of chlorine, Cl, for one of the hydrogen atoms, or two for two, three for three, or four for four. Thus we get compounds CH_3Cl, CH_2Cl_2, $CHCl_3$, and CCl_4. The third of these, $CHCl_3$, is chloroform, which has saved millions of people from the most awful pain that can be inflicted on human beings. When chloroform was first made by Liebig, three-quarters of a century ago, he was only studying the hydro-carbons.

How one man's study of a dry subject proved a blessing to mankind

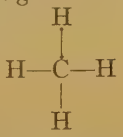
Many people would say this was a dry subject, and perhaps you think it is not worth while to know anything about it. Yet it is always worth while to study every part of Nature, and to use all the powers she confers on those who study her faithfully. Liebig was satisfied if, as a result of his work, he proved that three atoms of hydrogen in the molecule of marsh-gas could be replaced by three atoms of chlorine. That was a chemical *fact*, and all facts are precious. He could not guess that this new compound would prove to be one of the most priceless things in the world.

This is a great lesson for those who say that science should only study what is useful. No one knows what will or will not be useful; and the more we learn, the surer we are that all facts, every truth of every kind, will be useful some day. The chemist's work with the hydro-carbons, starting with marsh-gas, and with other carbon compounds related to it, has given mankind some of the most valuable things it possesses, and will yet give us many more.

How CH_4 affects every man who goes down into the earth for coal

Here we need only study marsh-gas, and may leave the other hydro-carbons out of account. Marsh-gas comes out of marshy ground, and can quite easily be collected in jars by stirring up the mud at the bottom of stagnant pools. It is also found in coal-gas, and is one of the gases which are formed from coal in coal-mines even before it is burned. Miners call it "fire damp," and when it mixes with the air of a mine, a match will explode it. Many miners have lost their lives in this way; but now they use the safety-lamp invented by Sir Humphry Davy, in which the light is enclosed, or else the mines are lighted by electricity.

Chemists do not go to marshes or coal-mines when they want marsh-gas, for they can make it for themselves quite easily from various compounds. It cannot be made directly, for carbon will not directly combine with hydrogen. It is a gas without color or odor — unfortunately for coal-miners — and when it is burned it forms carbon dioxide, CO_2, and water, H_2O. We have already learned how it is possible sometimes to write the formula of a compound in a graphic way, and if we remember what was said there about the number of "hands" that the carbon atom has, and the number that the hydrogen atom has, we shall see that the graphic formula of marsh-gas must be



From the hydro-carbons we get a large number of series of other compounds. For instance, we can make one of the hydrogen atoms be replaced by the group of atoms — OH, which we called hydroxyl. If we do this to marsh-gas, we get a substance with the formula CH_3OH. If we do it to the next hydro-carbon, C_2H_6, we get a substance C_2H_5OH, and so on through the whole series.

The terrible poison alcohol, which injures all life that it touches

Thus we get a new series of substances which are exceedingly important chemically, and in many other ways. They are called alcohols. The second alcohol, C_2H_5OH, is the liquid we usually call alcohol — as if there were no others — and it is at least as important in its effect on human life as any compound known to chemistry. All the alcohols are poisonous. The first, CH_3OH, is called *methyl-alcohol*, and as it is very disagreeable, it is added to ordinary alcohol, so that this may be used for burning, and for many other purposes, without people drinking it. The mixture is called methylated spirits, and everyone knows it well. The second alcohol is *the* alcohol. This is more poisonous than the first, and has been proved to injure the life of every form of living creature, animal or plant, that has been

exposed to it. Further on in the series of alcohols they become still more poisonous than either methyl-alcohol or ordinary alcohol, of which the real name is ethyl-alcohol. One of these other alcohols is very apt to occur in whisky; in fact, it always occurs in raw whisky.

WHY ALCOHOL IS ONE OF THE GREATEST CURSES IN THE WORLD

And, as almost anyone may sell raw whisky if he finds people foolish enough to buy it, we can often see the effects of this alcohol upon human beings. When whisky is kept for some time, this alcohol, which is often known as fusel oil, disappears, and so matured whisky is less quickly and seriously poisonous than raw whisky. But the best whisky, or "spirits" of any kind, contains a large quantity of ethyl-alcohol, which has a particular effect on the brain that makes people like it. Ethyl-alcohol, in this and other forms, is the principal curse of our civilization to-day, and as people are allowed to sell raw whisky to the primitive people we call "savages," who are very easily hurt by it, it is now the principal curse of them as well. *We* call *them* savages, but which of the two are really savages is another question. Alcohol is a very valuable liquid in some ways, as for cleaning purposes and for burning. It will probably soon be more valuable still, for very likely we shall learn to use it for running all kinds of machinery, when the world's supply of gasoline comes to an end.

HOW THE SUGAR IN THE JAM MAY TURN TO ALCOHOL

Among the series of carbon compounds we find a large number which contain carbon combined with hydrogen and oxygen in the proportions in which they occur in water; for instance, $C_6H_{10}O_5$, $C_{12}H_{22}O_{11}$, and so on. All these are called *carbo-hydrates*. We must try not to be confused between the two words hydro-carbons and carbo-hydrates. Before we learn anything more about the carbo-hydrates (which you and I are very fond of, for sugar is a carbo-hydrate), I want to tell you that they, or some of them, are the sources of alcohol. This has been known to mankind for at least ten thousand years, as has been proved by recent study of the remote past in Egypt. As a matter of fact, we have all noticed for ourselves that alcohol is formed from sugar. We have all tasted jam that had turned to have a curious taste which we probably did not much like. The sugar in the jam had begun to turn into alcohol—the jam had begun to ferment.

When sugar is decomposed by what we call fermentation, it always produces two things — alcohol and carbon dioxide. Bread is made to rise in this way. The dough contains a lot of starch, which is a carbo-hydrate, and that is changed into another carbo-hydrate, really very much the same chemically, which is sugar. The yeast is the ferment which acts on the sugar, producing alcohol and carbon dioxide. The alcohol evaporates and the carbon dioxide forms in little bubbles, which raise the dough and make the bread. In "aerated bread" no yeast is used, but carbon dioxide is forced into the bread from outside.

THE WAY IN WHICH SUGAR AND STARCH AND POTATOES ARE MADE INTO ALCOHOL

This fermentation of sugar to form alcohol and carbon dioxide is always occurring. When the sugar is in grapes the result is wine. Grapes are the fruit of the vine, and we should really pronounce vine, as if the *v* were *w*; the two words are the same. But alcohol can be made and is made from many things which do not contain sugar, so long as they contain starch; and as most plants contain starch, which is a sort of reserve food supply for them, it is easy to make alcohol. Barley is largely used for this purpose, and while some countries pay other countries for their wheat or else they would die of starvation, large areas, where wheat might be growing, are now growing barley to turn into whisky — which also has to be paid for in several ways by women and children and babies as well as those who drink it. Also potatoes are mostly starch, and so alcohol can readily be got from potatoes. Several of the native races of Africa are now being rapidly wiped out by potato spirit sent to them from European countries.

But for the chemist the most interesting thing is the way in which the fermentation of starch and sugar into alcohol is brought about. We must find out what yeast is, and how it does its work. Of course, the power of yeast

had been known for a long time, but it was less than a century ago that the astonishing discovery was made that yeast is a living creature.

How yeast lives and works and dies in making alcohol

Yeast, we now know, is a minute plant, and its natural food is sugar. In feeding on this sugar it turns it into alcohol and carbon dioxide. If the alcohol is allowed to get stronger and stronger, the yeast plant dies, just as any living creature dies if it is surrounded with the waste products of its own life; and therefore, in preparing alcoholic liquors, it is often necessary to remove the alcohol as it is formed, or the fermentation will stop, as the alcohol kills the plant that makes it, as it will kill any living creature if taken in large enough doses.

We have since learned that the yeast plant ferments alcohol by a special substance, a ferment, which it produces within its living cells; this substance can be separated, and even then will ferment sugar. We have also learned that all the processes of living creatures are carried on by means of ferments, and the chemistry of fermentation promises to be the most important part of the chemistry of the future, as it will deal with the chemical processes upon which life itself depends.

The great fact about a ferment is that it sets going chemical changes without being changed itself. Thus there is no limit to the amount of work that even a tiny quantity of a ferment can do. In other chemical changes the thing that starts the change is used up. We can make only a fixed quantity of salt out of hydrochloric acid and soda, and they are used up in the process; but a ferment acts on the substances round it without being acted upon itself. Here we have only mentioned alcoholic fermentation, which is the one that has been longest known, and is much the most important we know yet; but this is only one example out of hundreds.

The substances called ethers and aldehydes, and the work they do

Closely related to the alcohols there is a long series of substances called *ethers*. One of them — the one that corresponds to ethyl-alcohol — is very valuable, like chloroform, because people who breathe it cannot feel pain.

Then there is another series called *aldehydes*, and this is equally long and closely related to the others. Aldehyde is a short way of saying alcohol-dehydrogen, and it tells us that the aldehydes are alcohols which have lost some of their hydrogen.

The first aldehyde is very useful, and is usually known as *formalin*, and is very deadly to microbes, and is largely used to preserve things; but it is a poison, and its use to preserve food is very wrong, and has been forbidden.

Another aldehyde, called paraldehyde, is one of the very best of all the medicines used to make people sleep when they are ill.

The formula of formalin is CH_2O, and this is very interesting. We know that plants make the carbo-hydrates, such as starch and sugar. We know that these carbo-hydrates have in them carbon, and hydrogen and oxygen in the same proportions as in water. We know, too, that plants get the carbon from the carbon dioxide of the air by their leaves, and the water from the soil by their roots. Now, the simplest combination of water and carbon that we can imagine is CH_2O, and we only need to multiply that, say, by six, to get sugar, $C_6H_{12}O_6$. So botanists expect soon to prove that the first thing the plant forms — just for a moment — in making sugar from water and carbon is formalin, CH_2O.

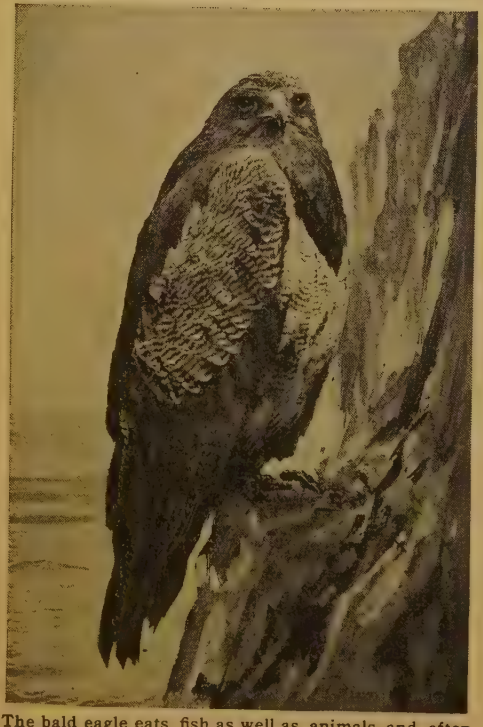
The end of our brief study of chemistry

Many books have been devoted solely to the hydro-carbons, the alcohols, the aldehydes, and the acids which correspond to and are made from them. We know that alcoholic drinks often turn sour, and the cause is that the alcohol has turned into vinegar or acetic acid. Here we cannot go farther. Only we must conclude this brief account of chemistry by saying that another department of it, of no less importance, deals with the compound called benzene, C_6H_6, and with the thousands of compounds — many of them very valuable, such as carbolic acid — which are derived from it. But don't mix up carbonic acid and carbolic acid, as I used to do at school!

THE NEXT STORY OF THE EARTH BEGINS ON 1959.

THE KING OF THE HUNTING BIRDS

The king of the hunting birds is the eagle, and the most splendid of the order is the golden eagle. In the few places in America where it still makes its home, it nests in solitary grandeur far up the mountain-side. There it carries birds and animals to its young ones, and watches over them with the tenderest care.



The bald eagle eats fish as well as animals and often robs birds less powerful than itself. It can drag a salmon from the water as easily as it can catch a hare.

The osprey is the great fishing hawk. It catches its prey in the sea and in the rivers and lakes. If not disturbed, it builds year after year in the same place.

NATURE'S WINGED HUNTSMEN

CONTINUED FROM 1829

THE air has its lions and tigers —not real lions and tigers, but birds which, in their way, are as fierce and hungry as the great four-footed animals of the jungle and the plain. When we study their lives, we can see that the eagles, the falcons, the kites, the buzzards, the vultures, the owls, and other flesh-eating birds, play a similar part to that played by the flesh-eating animals. Some strike down their prey, kill and eat it; others wait until the death of an animal or a man has taken place before they begin their meal.

First in the scale of splendor among the hunting birds comes the eagle, the most noble-looking of birds that fly. It is the king of the falcon family, which includes no fewer than 300 species of birds that hunt their prey by day. Here for the moment we will keep to the eagles proper, and glance at some of the most important.

The largest are the sea-eagles. Of these there are several species, scattered over a great part of the world. They live in the northern parts of Europe and Asia, and in Greenland. They are still found in Scotland and the northern islands, and in wild parts of Ireland. Occasionally one may stray into England. One was caught in Windsor Forest in 1856, measuring eight feet across the wings and three feet two inches from the point of the beak to the tip of the tail, and weighing twenty-two pounds.

Generally speaking, however, in the British Isles we must go to the deer forests and to the bare, barren hills still farther north of Scotland to find eagles. There the sea-eagles may be seen in their glory; and the splendid golden eagle is, though not frequently met, still seen with sufficient frequency to remind us of the days when Scotland was more generally the home of wild animals and birds once common in these islands.

The sea-eagle is so called not because it swims in the sea, but because, in addition to eating birds and animals as food, it likes fish, and, pouncing down into the sea, river or lake, it draws forth from the water whatever may have attracted its attention. The American bald eagle is a kind of sea-eagle.

Once a sea-eagle was seen to drop from the air swiftly into the water and plunge its talons into a fine salmon. The salmon struggled violently and dragged the great bird under the water. The eagle could not release its talons, and the salmon would not cease struggling and swimming, and so keen were both on their battle that a man was able to steal up and secure both bird and salmon. The sea-eagle varies his diet of fish with meals of game birds, hares, rabbits, young lambs and kids.

The largest and handsomest eagle of either Europe or America is the golden, which our Indians named war-eagle, because they made their war-bonnets of its feathers. It has almost disappeared from the eastern half of the United States, mainly because wasteful men have shot every one they saw. Those that remain are to be found in the wilder parts of our mountains, or in the Far West, or in Canada. In Europe, also, they are rare, except in out-of-the-way districts.

WHERE THE GOLDEN EAGLE BUILDS ITS NEST AND MAKES ITS LARDER

Like most other birds of prey, the female golden eagle is larger than the male. Her length from the tip of beak to the end of tail, is about a yard; while the male eagle is three inches less. The plumage of these birds is rich and handsome. While the colors may differ, the majority of these birds have feathers of a golden-brown hue. The golden color occurs near the tips of the feathers, and gives a golden appearance to the whole. The bird builds in high, rocky places far from the haunts of men, and the rough, strong nest cannot be reached except by a rope let down from above.

Eagles are watchful parents. They will fiercely attack anyone who attempts to approach the nest in which their young ones are. The little eagles have big appetites, and the parent birds have to maintain quite a larder for them. The larder is generally a large rock near the nest, so that the eaglets can go to it and feed while the parent birds are away. Here on this stone hares and rabbits and birds are placed, and these the eaglets eat at their leisure.

If the little eagles need so much food, what do the big eagles require? They have hearty appetites to support their weight and flying powers.

THE STORY THAT THE EAGLE CARRIES OFF CHILDREN IS NOT TRUE

A golden eagle will eat in the course of a day a couple of partridges or ptarmigan or a hare. It can live on that, but, like other creatures, it prefers variety in its food. These eagles will sometimes willingly eat putrid flesh as a change from their ordinary diet; and men, knowing this, set traps and catch them as if they were the silliest birds. But the desire for change does not end here. The eagles carry off lambs to their nests, and they attack and kill deer. It has been told a thousand times that eagles carry off children; but though we know for a fact that they will *attack* children guarding flocks which the eagles desire to rob, there is no proof that children ever have been carried away by these birds.

As to their attacking deer, there is no such doubt. They set about their work with as much method and skill as if it were part of their everyday life. Generally they will attack a young deer, that being more easy to kill. They drop from the sky like a flash upon the back of the deer they mean to have. If they can, they drive it from its mother. The faithful hind, if she can keep her little one close beside her, will fight the great eagle with splendid courage, and, striking out with her front feet, may beat it off. But if the fawn can be driven away from the hind, the hind becomes so alarmed that she seems unable to act, and in that case the eagle will send the little deer racing away in terror and kill it with its terrible talons and beak.

HOW THE EAGLE WILL TERRIFY A HERD OF DEER TO CATCH ITS PREY

If this plan cannot be tried, the eagle does a still more amazing thing.

It will hover over a herd and frighten them into running away. Just as they are bounding round some narrow path which winds round the top of a precipice, the bird will swoop down upon the back of the deer, and drive home its great claws. The deer in terror seeks to throw off its foe, and generally jumps down the precipice, so killing itself and affording the eagle a meal without further trouble. That is just what the eagle wants, and it is for that reason that it makes its attack when the deer are in so perilous a place.

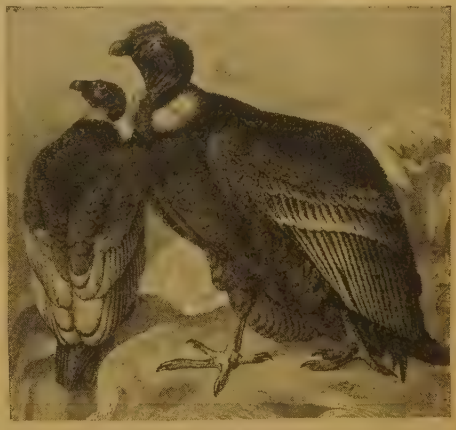
The only chance for a young deer when so attacked is to bolt into a narrow division between the rocks. There the eagle is practically powerless, for, seeing that its wings, when outspread, measure from eight feet to ten feet across, of course it cannot fly in a little space, and it will not venture in on foot. Eagles have been seen to suffer defeat in this way in Scottish deer forests. But they do not, as a rule, lose their prey.

THE GREAT FAMILY OF VULTURES

The strangest-looking vulture of the family is the king vulture, whose extraordinary bare neck is brilliantly tinted with orange, purple, and crimson.

Griffin vultures are found in Europe as well as in the East. They build on high rocks, but sometimes steal the nests which eagles have made and left.

The Egyptian vulture was the chief scavenger of the land of Pharaoh. The Egyptians valued it, and carved its likeness on their monuments and tombs.



The condor is the largest of the vulture, and, indeed, of all birds of prey. It makes its nest in mountains, and flies as gracefully as a winged yacht.

The lammergeier is known as the bearded vulture. It descends from its mountain home to eat dead animals, and carries smaller ones to its nestlings.

The secretary vulture kills and eats snakes in South Africa. Its feathered head makes it look like a clerk, with a quill pen in his ear; hence its name.

Sir Charles Mordaunt saw a remarkable sight in the forest of Glen Feshie, showing how the eagle can hunt. While he was stalking a herd of deer, he saw through his telescope that the animals became suddenly alarmed. He knew he had not caused their fright, for he was too far away. Suddenly a great eagle swooped into sight and attacked one of the small stags. Its plan was to drive it away from the rest of the herd, so that they could not help it. The bird did not attack with beak or talons, but kept striking the stag heavy blows on the back with the middle joint of his powerful wings. Several times it seemed as if he would fail to get the stag away, for the bird kept rising into the air as if to fly away. But each time he returned with more determination, and at last he did get the stag away from the rest of the herd and killed it. The man who had gone out to kill a deer by the aid of a gun saw his victim taken before his eyes by one of the hunters of the air.

How an Eagle Escaped from Westminster and was Tempted Home

When he cannot get game or deer the eagle will eat many other things. Frank Buckland, of whom we have already read in these stories, kept a sea-eagle at Oxford, and, hearing a great squealing in the middle of the night, went out and found that the bird was eating a hedgehog, bones, prickles and all. Another day it tried to eat a dog, and after that nearly made a meal of Buckland's pet monkey. Several cats and guinea-pigs and a tame jackdaw were not fortunate enough to escape the clutches of this hungry bird.

When Buckland left the University he brought his eagle to London and kept it at the house of his father, the Dean of Westminster. One day it managed to escape. By fluttering and clawing its way up a wall, it got on the wing. At first it was very unsteady, but when at last it got clear of the houses, away it sailed in splendor. Its old strength came back to it, and the eyes of all London were turned towards the sky where the noble bird was soaring. All day it was absent, and anybody but Buckland would have given up hope of ever seeing it again. But he knew how wonderful is the sight of the eagle. He tied a chicken to a stick in the courtyard from which the eagle had escaped. Just before dark he heard the beating of huge wings, and to his joy saw his eagle descending from the clouds. Flying high above London, it had seen the chicken and dropped like a flash to secure it in the yard which had been its home. While the eagle was engaged in eating the chicken, Buckland popped a cloth over its head and captured it. Afterwards he presented it to the Zoo, where possibly it remains to this day, for eagles live for from one hundred to two hundred years. They are the longest-lived of all the birds.

An Eagle's Game of Dropping and Catching in the Clouds

The sight of the eagle, so keen and powerful, is the gift of Nature; but its ability to catch things, though inherited, is developed by practice. An eagle has been seen to snatch up a wounded grouse as it fell through the air after being shot. Another swooped down and caught a hare which was being chased by hounds. The young eagle practises to enable it to do things of this sort.

One of these birds was seen to catch a mountain hare in Scotland. Away it went with the hare, up into the sky. Then, when far up, it let the hare drop from its talons. While the hare was dropping through the air, the eagle descended upon it, and caught it. Then it carried it up again, and once more let it drop, and again caught it. This it repeated several times, never once failing to catch the hare as it was falling through the air. The young eagle was at play, but it was practising for the serious business of life. Very wonderful it is that a bird should be able to give a heavy thing like a hare a good start in a fall through the air towards the earth, then catch it up and secure it.

The Wonderful Love of a Free Eagle for its Trapped Comrade

Fierce as the eagle is, it is affectionate to its kind. A strange example of this was afforded in a Scottish forest, where a beautiful golden eagle was found dead in a trap which had been set to catch a fox. The bird had espied the bait afar off, and, going down to get it, had been seized by the trap and left to die a miserable death. The strange thing was that the eagle had not died of starvation, nor from any serious injury.

It was caught only by one claw. Apparently the knowledge that it was a prisoner had killed it, for there was abundant food beside it. Other eagles, seeing the prisoner in the trap, had brought it food. There, beside the dead eagle, were two grouse, and a hare, still warm when the hunters came to the trap.

THE OSPREY THAT CATCHES FISHES, AND ITS FOE THE BALD-HEADED EAGLE

Another fine hunter of both continents is the osprey, as they call it in Europe, or fish-hawk, as it is known in America. It is a handsome bird, living entirely on fish, which it catches with great skill by dashing into the sea, or lake, or broad river near which it resides. Where it is protected it not only becomes numerous, but so tame as to nest upon platforms mounted on poles, making a nest which is repaired and added to year after year, until it becomes as big as a cart-load. It is made of sticks, and amid the rough rustic work of it outside, blackbirds, wrens, and other birds often build their little cradles, and lay and hatch their eggs, unharmed by the fish hawk, just as grateful tenants cluster about the castle of a generous lord.

In Scotland the osprey has an enemy in the sea-eagle, which will occasionally rob it of the fish it has caught. In North America the bird the osprey most dreads is the great white-headed eagle, the bird which, because of its white crown, we Americans call the bald-headed eagle. This is a bird which will eat pretty nearly anything. Though fond of fish, it is no fisherman, so it robs the osprey as it is returning to its nest with a fish in its talons.

It is impossible to be fond of a vulture, valuable as its work often is when it plays the scavenger. It is impossible not to think of the vultures on the battlefield, where dead and dying men are lying. Nor can we forget that it is the hideous vulture which the weary wayfarer, lost and dying in the great desert, has to fear.

THE VULTURE THAT DROPS A TORTOISE FROM A HEIGHT TO SPLIT ITS SHELL

There are two kinds of vultures that are less horrid than the others. The splendid lammergeier, or lammergeyer, which soars above the Italian Alps, the Caucasus, and the hills of Spain, is not so repulsive a creature as the ordinary vulture. The average vulture has dirty, dusky-looking plumage, and its neck is bare, with the discolored flesh showing plainly. The lammergeier is feathered to the beak, and sails with the grace of a yacht in the air.

Stories are told of its attacking children, but they have not been proved. Its claws are not strong enough to enable it to carry off a child, and it attacks only what it can eat. Sometimes it will take a live animal, but, generally speaking, its food consists of the flesh of animals which have died. In India, where it is very abundant, it haunts slaughter-houses and the soldiers' quarters, on the look-out for scraps, and particularly for bones. These it carries to a height, then drops them on the rocks to split them. It does the same thing with tortoises.

The biggest of all the vultures is the condor, the huge, heavy bird which makes its home thousands of feet high in the Andes of Peru and Chile. The male bird is about four feet in length, and its wing-spread is from eight to eleven feet or more. The male bird has a large, fleshy wattle, which forms a crest to the head.

THE MIGHTY CONDOR THAT SEEMS TO BE ASLEEP ABOVE THE MOUNTAIN-TOPS

Both male and female have powerful beaks, but their claws, while they help in tearing their food, have not power enough to enable them to carry away heavy bodies. Their food consists chiefly of animals of the mountain-side and the plain, which have either died a natural death or been killed by wild animals.

The condor has marvelous eyesight, and, though it sails high up in the air so smoothly that men have believed it to be asleep while thus flying, hunters say that it is closely watching some animal on the plain thousands of feet below, which is being killed or is near death from disease. Suddenly the bird drops like a stone through the air. Others from all quarters follow; and hunters see a carcase swarming with birds which a moment before had been specks in the sky.

The condor has this trait in common with the other vultures—it can fast for several days, but to make up for this it gorges itself when it gets the chance. This accounts for the fact that cattlemen are able to catch it with ropes. It seems

unlikely that they should lasso a grand flier like the condor, but the bird so fills itself with food that it cannot rise into the air swiftly enough to avoid the noose which the expert cattleman throws.

THE POWERFUL WEAPONS WITH WHICH THE WINGED SCAVENGERS ARE ARMED

But the true vultures are greedier than even the condor. One, an Egyptian vulture has been seen to gorge itself to such an extent that it could not move, but lay on its side and still fed. There are many kinds of vultures, some more horrid than others, but none nice. They share with the hyenas and jackals and wild dogs the filth of the villages of the East. They eat also all the putrid flesh of dead animals, and kill lambs and kids that are too feeble to defend themselves.

They have powerful feet and claws, but not such as would enable them to carry off heavy burdens. Their beaks are the great weapons of attack. With these the larger ones can tear off the skin of a horse or buffalo, and tear the flesh from the bones, so that nothing but the skeleton remains. We have no such vultures as these in North America, but we have a good imitation of one in the turkey buzzard of the Southern States and Central America which is neither a turkey nor a buzzard, but a small cousin of the vultures. It is black all over, except its naked red head; and is always on the look out for carrion. Therefore the people in some southern towns encourage it to flock about their markets and back streets, knowing that it will dispose of much refuse that it would be unhealthful to allow to remain.

PHARAOH'S CHICKENS, AND THE VULTURE THAT EATS REPTILES

The king vulture's naked neck is colored with shades of orange, purple, and crimson, and it has extraordinary colored fleshy wattles all round its nostrils and the root of its cruel-looking beak. All the vultures have this fact in their favor that they are very good parents. Long ago the Egyptians so highly regarded the vulture, which in Egypt has the name of Pharaoh's chickens, that they frequently included it in their drawings and carvings as the emblem of the love of parents for their children. In some parts of the East the vulture is protected by law because of its value as a scavenger.

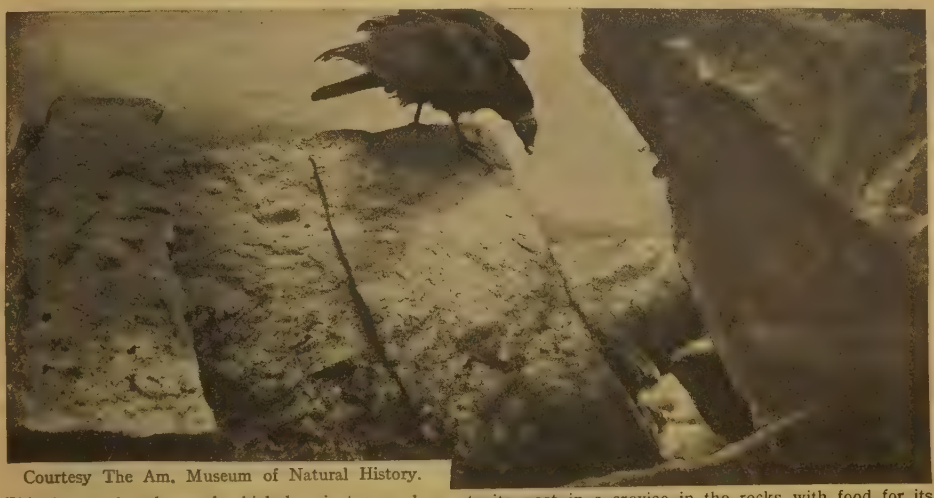
Before passing from the vulture family we must say a good word for the secretary bird, which is really a vulture. It is a curious, long-legged, long-tailed bird, with a strong, hooked beak and strong legs armed with stout scales, and claws admirably adapted to the purpose which they have to serve. Its food consists of reptiles, and among these is included a great number of venomous serpents. The bird has no fear of them. Some have been seen to avoid big snakes, but possibly that was because the birds had already been well fed. Generally it dashes at the snake, and, with its wings spread out towards the front to keep the serpent from biting it, beats it, pecks it, and stamps on it until the snake is killed. Small snakes it swallows whole; larger ones it tears to pieces. This bird is found chiefly in South Africa, where it is so highly valued as the foe of snakes that a fine is imposed for killing it. It gets the name of secretary bird from the feathers which grow out from the back of its head, looking very much like quill pens behind the ear of a clerk.

SOME OF THE SMALLER MEMBERS OF THE FAMILY OF BIRD HUNTERS

Of course, there are smaller birds in this great family of hunters than those we have so far considered. The buzzards, kites, and falcons, though having much the same nature as their larger relatives, are built on a smaller scale. The buzzard measures from twenty to twenty-two inches in length, and it has the strong beak and sharp claws of its family. But it is not so active a bird as the rest. At times it flies gloriously high up, in great circles, with very few movements of the wings which the eye can detect. As a rule, however, it prefers to get its living easily, by watching and waiting, and pouncing at the right moment upon its victim, whether that victim be rat, mouse, reptile, or bird. Parts of its plumage are very downy, so that the bird can drop down upon its astonished victim without making a sound. The buzzard is not known in this country, but is common in the old world. It has been practically killed off in England.

Kites are known in all parts of the world. Two species are common in this country, and one of them—the

SOME BIRDS THAT HUNT FOR BEASTS



Courtesy The Am. Museum of Natural History.

This is a turkey buzzard which has just come home to its nest in a crevice in the rocks with food for its hungry children. The turkey buzzard is neither a turkey nor a buzzard, but a cousin of the vultures.

The smallest falcon is the merlin, a fierce foe, but easy to tame and make a friend of. This is the bird which the lark flies so high to avoid.

Men take the peregrine falcon to hunt, with a hood over its head. As the game appears, the hood is taken off, and the falcon sees its prey and flies after it.

The strong, fast-flying sparrow-hawk hunts blackbirds, thrushes, partridges, rabbits, and hares.

The kite has a forked tail, and looks, in flying, like a big swallow. Kites were once people's scavengers.

The goshawk catches its prey by its very swift flight, clutches it, and drops to the ground with it.

swallow-tailed hawk—is so strong that it is said it sometimes flies as far as Great Britain. In the East the kite is valued as a scavenger, just as it was in Europe in olden days. It cannot be mistaken when it is seen, for the black and brown and reddish plumage of the bird and its long, forked, swallow-like tail make it easily recognizable.

THE EVIL WORK OF THE KITE AND THE GOOD WORK THAT HE DOES

The kite robs rabbit warrens, and likes game birds; but the harm that it does in this way must be more than made up by the good it works in destroying rats and mice, and snakes and moles.

Next we come to the true falcons—handsome, noble-looking birds, of which the most famous are the jerfalcon, the peregrine, the lanner, the saker, the Barbary falcon, the Indian shaheen, the hobby, and the merlin—all long-winged, dark-eyed birds, which rise high in the air, then descend like thunderbolts upon their prey and bear it to the ground; then the strong, swift goshawk and sparrow-hawk, birds with shorter wings and yellow eyes. These are the names given by falconers to European hawks, but much the same exist in North America.

These birds play the same part in bird life that the cheetah plays in the animal world. Like the powerful cheetah, they are by nature wild and fierce, but they are trained to hunt for men.

HOW THE FALCON BIRDS ARE TAUGHT TO CATCH OTHER BIRDS FOR MEN

Soft leather straps are fastened to their legs so that they cannot fly away at will. A hood is put over the head, leaving the beak and nostrils free for breathing, but preventing the bird from seeing. When the hood is removed, the bird is shown a piece of meat, and has to hop from its perch on to the wrist of the man who holds the food. He has a glove on, so that the sharp talons of the bird will not hurt him. When the bird gets used to this sort of treatment, it knows that by jumping to the wrist it will be fed. Then the distance is increased. With a light line tied to its leg, it is made to fly twenty or thirty yards for its food. Then in time the line is removed from the leg, and the bird flies free. After a while, instead of its usual food, it is made to fly to a bird or a small animal, and catches this and returns to the wrist of its master. In this way the bird is gradually taught to hunt, and to return each time to its owner, who then gives it a good meal. It is always hungry when it starts; then, when it is a master of its work, it is carried on a perch with the hood over its head to a place where there are birds or game. The hood is slipped off, the bird sees the game, and brings it back to its master.

Like all other falcons, the peregrine is a magnificent hunter. It is supposed to be able to fly at the rate of one hundred and fifty miles an hour, yet it flies with such delicacy of direction that it can follow a smaller bird through mazes of branches and undergrowth, and take a bird off a bough without stopping or touching any part of the tree.

HOW STUPID FARMERS SHOOT THEIR BIRD FRIENDS

The merlin is another beautiful flier, but its length is only from ten to thirteen inches. There would never be a plague of birds to destroy the fruit of a neighborhood if a few of these dashing little hawks were allowed to live about. Perhaps the kestrel might be still more useful. This fine little hawk kills and eats great numbers of mice. It eats beetles, and caterpillars, and grubs, and is a really excellent friend of the farmer. Wise men have watched its habits, and examined the contents of its stomach, and so know its real value, yet stupid farmers still shoot it.

The harriers, another type of falcon, also dispose of many rats and mice and other enemies of the farmer, but as these things take birds which we want it is not surprizing that the farmer, always ready to shoot, has no mercy for them. Most of the hawks are very brave birds; their numbers are few, and if they were not brave the other birds would kill them.

Perhaps the bravest of all are the caracaras of South America, which collect together to fight the eagle or vulture that dares to come in their way.

We have a sort of vulture in this country, though it is not a member of the eagle family. Ours is the raven, the great black bird with the huge, powerful beak, which makes its nest in

THE CROW FAMILY AND THE OWLS

Caracaras hunt together and attack eagles or vultures which meet them.

The raven is valuable as an insect-eater, but cruel, and kills lambs.

The kestrel is a beautiful little hawk. It can be tamed and trained.

Carrion-crows eat dead animals and rob other birds.

Rooks can be distinguished from crows by their rookery. Crows nest in solitude; rooks build hundreds of nests together. Here we see a big rookery.

The magpie is an amusing talker, but a great thief.

The white-breasted crow eats animals that die in Africa, where its home is.

The jackdaw cannot help taking anything bright that catches his eye.

Here we have three fine owls. In the centre is the barn-owl with its eggs. On the right is the fierce hawk-owl. On the left is an eagle-owl catching a hare. Powerful and savage, it hunts in the day as well as at night.

The photographs on these pages are by Lewis Medland, W. P. Dando, Oliver Pike, R. B. Lodge, A. Rudland, Messrs. Underwood & Underwood, London, and Gambier Bolton. Those of Mr. Gambier Bolton are published by permission of the Autotype Company, the owners of the copyright of all the photographs by that photographer which appear in this book.

* Copyright by Underwood & Underwood, N. Y.

the wildest parts of the country, as far as possible from the homes of men.

It will eat grubs and so forth, but its favorite food is fish. It will kill hares and rabbits and other birds also. It attacks lambs, sick sheep, cattle, and deer, by pecking out their eyes. It used to be common all over the United States, but now is extinct, except in the Rocky Mountains. It also occurs in Alaska and along the Arctic coasts. Ravens are a large sort of crow.

THE MERCILESS CROW THAT ROBS NESTS, AND THE JOLLY LITTLE JACKDAW

The carrion-crow has a nature like the vulture and the raven, but the bird is smaller, and when it attacks a big living animal it cannot do its work single-handed, but advances in numbers. Its habit of eating putrid flesh is, of course, unpleasant, but it is of importance to the health of the place in which the crow finds its meals. Crows are merciless thieves. They rob other birds' nests, killing and eating the young ones and even carrying off the unhatched eggs. To do this the crow thrusts his strong beak through one end of the egg, then carries the shell and its contents away as on a spear.

The jolly little jackdaw belongs to this family. It is not an American bird; but the magpie belongs to both continents. Its handsome plumage of glossy greenish-black and white is a familiar sight in Europe, where everyone enjoys its bright ways; but in America it is a bird wholly of the Rocky Mountain region, where it is noticed principally for its queer noises and for the great covered nest of sticks which it heaps up in some thorn-tree. When tamed, it is an amusing talker.

One of the most singular of the birds of prey is the shrike, or butcher bird. It catches small birds, mice, and so on, and fixes their bodies upon thorns; then it can easily skin and eat such as it wants, leaving the others for the time to come when it is once more hungry.

THE OWL THAT COMES OUT WHEN BOYS AND GIRLS ARE GOING TO BED

Here we must say good-bye to the birds which hunt while the sun is up, and good-evening to the birds which fly by night—the owls. These are little known to young people, for they are just going to bed when the owls are coming out. The owls of this country are purely nocturnal—night birds. One or two species abroad can see quite well in a bright light, but ours cannot. Their eyes are so formed that they can collect light from what to us is darkness. They can see when the daylight is not quite gone; but in the direct light of the sun they are quite dazed.

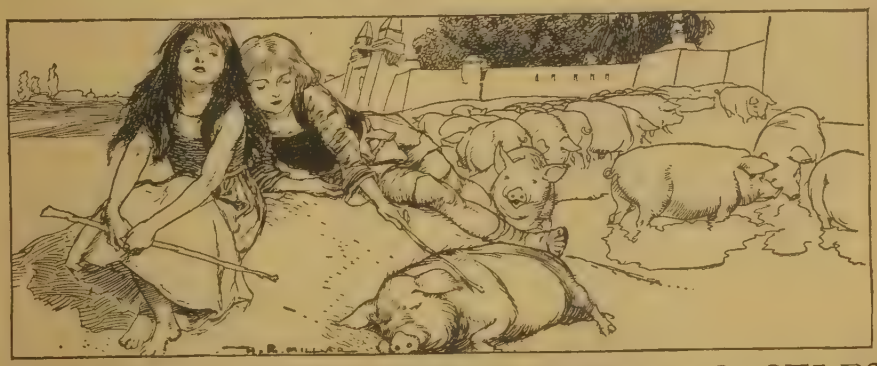
The owl works and feeds when we are asleep. It has eyes differently placed from those of any other bird—close together in front, so that it must look straight ahead. To make up for this, it can turn its head with the greatest ease in any direction. The power of its eyes in the darkness is quite wonderful. Most of us, if we were quite close to a field mouse or rat moving stealthily over a field, would do well to see it against the earth, like which its coat is colored. But the owl sees it from afar through the darkness, pounces noiselessly down, and seizes it. It can catch the mouse and the mole and the rat; it can catch fish as they rise to the surface of the water.

HOW THE COURAGE OF THE OWL GOES IN THE DAYTIME

There are about two hundred species of owls. Some are tiny owls; some are big eagle-owls, twenty-eight inches in length, very fierce and strong, ready to attack a man who goes near, and able to kill fawns and large game birds, and to do battle with the golden eagle. The courage of one of these owls goes in the daytime, and then little birds, led by a crow, may find it and mob it out into the open, and lead it a terrible dance. But when night comes, and the bird can see, none but a mighty eagle dare to battle with it. This owl is called in America "great horned."

The hawk-owl is one of the few owls which work by day. It is big and strong and savage. There are owls with great ear-tufts of feathers, and owls with none at all; some are snowy white, others are mottled. Some live in burrows with the prairie marmots; some make burrows for themselves. Mostly they live in hollow trees, or in church belfries or other high towers. Among so many owls, of course, there are those which do harm, but those in this country do more good then evil.

THE NEXT STORIES OF BIRDS BEGIN ON 1971.



LORDS OF THE GREY & WHITE CASTLES

This story is another of the stories told by "Granny's Wonderful Chair," described on page 1045

CONTINUED FROM 1812

ONCE upon a time there lived two noble lords in the east country. In the midst of his land each lord had a stately castle; one was built of the white freestone, the other of the grey granite. So the one was called Lord of the White Castle, and the other Lord of the Grey.

The Lord of the Grey Castle had a little son, and the Lord of the White a little daughter; and when they feasted in each other's halls, it was their custom to say: "When our children grow up they will marry, and have our castles and our lands."

So the lords and their little children and tenants lived happily till one Michaelmas night, as they were all feasting in the hall of the White Castle, there came a traveler to the gate. He had seen many strange sights and countries, and, like most people, he liked to tell his tales. So the Lord of the White Castle said:

"Good stranger, what was the greatest wonder you ever saw in all your travels?"

"The most wonderful sight that ever I saw," replied the traveler, "was at the end of yonder forest, where in an ancient wooden house there sits an old woman weaving her own hair into grey cloth on an old crazy loom. When she wants more yarn she cuts off her own grey hair, and it grows so quickly that though I saw it cut off in the morning, it filled the room before noon."

When the traveler had gone on his way, the Lord of the White Castle could neither eat nor sleep for wishing to see the old woman that wove her own hair. At length he made up his mind to explore the forest in search of her ancient house, and told the Lord of the Grey Castle his intention.

So the two agreed to set out privately, lest the other lords of the land might laugh at them. The Lord of the White Castle had a steward who had served him many years, and his name was Reckoning Robin. To him he said:

"I am going on a long journey with my friend. Be careful of my goods, and, above all things, be kind to my little daughter Loveleaves till my return."

The Lord of the Grey Castle also had a steward who had served him many years, and his name was Wary Will. To him he said:

"I am going on a journey with my friend. Be careful of my goods, and, above all things, be kind to my little son Woodwender till my return."

So these lords kissed their children while they slept, and set out. The children missed their fathers; the tenants missed their lords. None but the stewards could tell what had become of them; but seven months wore away and they did not come back. The lords had thought their

stewards faithful, because they served so well under their eyes; but, instead of that, both were proud and crafty, and, thinking that some evil had happened to their masters, they set themselves to be lords in their place.

Reckoning Robin had a son called Hardhold, and Wary Will a daughter called Drypenny. Their fathers resolved to make a young lord and lady of them; so they took the silk clothes which Woodwender and Loveleaves used to wear to dress them, clothing the lords' children in rags. The stewards' children sat at the chief tables, and slept in the best chambers, while Woodwender and Loveleaves were sent to mind the pigs and sleep on straw in the granary.

One night in walked a great bear. "Good-evening, bear!" said Lady Greensleeves. "What is the news in your neighborhood?"

The poor children had no one to take their part. Every morning at sunrise they were sent out to watch a great herd of pigs on a wide, unfenced pasture hard by the forest. Still, Woodwender and Loveleaves comforted each other, saying their fathers would come back; so they looked handsome as ever, while Hardhold and Drypenny grew crosser and uglier every day.

The crafty stewards did not like this. They thought their children ought to look genteel, and Woodwender and Loveleaves like young swineherds; so they sent them to a wilder pasture, still nearer the forest, and gave them two great black hogs, more unruly than all the rest, to keep.

One sultry day, about midsummer, Woodwender and Loveleaves sat down in the shadow of a mossy rock. Woodwender saw that the two great hogs were missing. Thinking they must have gone to the forest, the poor children ran to search for them, but, though they searched for hours, no trace of the favorite hogs could be seen.

At last they saw a lady coming along the path. In her right hand she carried a holly-branch, and the most remarkable part of her dress was a pair of long sleeves, as green as the very grass.

"Who are you?" she said. And the children told her their story, and how they had lost the hogs.

"Well," said the lady, "you are the fairest pig-keepers that ever came this way. Choose whether you will go home and keep pigs for Reckoning Robin and Wary Will, or live in the free forest with me."

"We will stay with you," said the children, "for we do not like keeping pigs!"

While they spoke, the lady slipped her holly-branch through the ivy, as if it had been a key. Presently a door opened in the oak, and there was a fair house. When they stepped in, the lady said:

"A hundred years I have lived here, and my name is Lady Greensleeves. I have no friend or servant except my dwarf Corner, who comes to me at the end of harvest."

By this time the children saw how welcome they were. Lady Greensleeves gave them deer's milk and cakes of nut-flour, and soft green moss to sleep on; and they forgot all their troubles.

All that summer Woodwender and Loveleaves lived with her in the great oak-tree; and the children would have been happy, but that they could hear no tidings of their fathers. At last the leaves began to fade, and the flowers to fall. Lady Greensleeves said that Corner was coming; and one moonlight night she set her door open, saying she expected some old friends to tell her the news of the forest. Then in walked a great brown bear.

"Good evening, lady!" said the bear.

"Good-evening, bear!" said Lady Greensleeves. "What is the news in your neighborhood?"

"Not much," said the bear; "only the fawns are growing very cunning—one can't catch above three in a day."

"That's bad news," said Lady Greensleeves; and in flew a great black raven.

"Good-evening, lady!" said the raven.

"Good-evening, raven!" said Lady Greensleeves. "What is the news in your neighborhood?"

"Not much," said the raven; "only in a hundred years or so we shall be very private—the trees will be so thick."

"How is that?" said Lady Greensleeves.

"Oh!" said the raven, "have you not heard how the king of the forest fairies laid a spell on two noble lords who were traveling through his dominions to see the old woman that weaves her own hair? They had thinned his oaks every year, cutting firewood for the poor; so the king met them in the likeness of a hunter, and asked them to drink out of his oaken goblet, because the day was warm; and when the two lords drank they forgot their lands and their children, and thought of nothing in all this world but the planting of acorns, which they now do day and night in the heart of the forest, and will never cease till someone makes them pause in their work before the sun sets."

In the morning the children went to Lady Greensleeves and said:

"We have heard what the raven told last night, and we know the two lords are our fathers; tell us how the spell may be broken!"

"I fear the king of the forest fairies," said Lady Greensleeves; "but I will tell you what you may do. At the end of the path which leads from this dell turn your faces to the north, and you will find a narrow way sprinkled over with black feathers—keep that path, and it will lead you straight to the ravens' neighborhood, where you will find your fathers planting acorns under the forest trees. Watch till the sun is near setting, and tell them the most wonderful things you know to make them forget their work; but be sure that you tell nothing but truth, and drink nothing but running water, or you will certainly fall into the power of the fairy king."

In a great opening where the oaks grew thinnest, Loveleaves and Woodwender saw their fathers busy digging and planting acorns.

The children thanked her for this good counsel; and they soon found the narrow way sprinkled over with black feathers. On the evening of the seventh day they came into the ravens' neigh-

borhood, and in a great opening where the oaks grew thinnest, the children saw their own fathers busy digging and planting acorns. The children called them by their names, and ran to kiss them, each saying: "Dear father, come back to your castle and your people!"

But the lords replied:

"We know of no castles and no people. There is nothing in all this world but oak-trees and acorns."

Loveleaves and Woodwender sat down, and ate some food in great sorrow. When they had finished, both went to a stream hard by and began to drink the clear water; and as they drank there came through the oaks a gay young hunter, and in his hand he carried a huge oaken goblet. It was filled with milk up to the brim. And as the hunter came near he said: "Fair children, leave that muddy water, and come and drink with me." But Woodwender and Loveleaves answered: "Thanks, good hunter; but we have promised to drink nothing but running water."

Still the hunter came nearer with his goblet saying: "That water is foul; it may do for woodcutters, but not for such fair children as you. Were you not reared in palaces?" But the boy and girl answered him: "No; we were reared in castles, and are the children of yonder lords; tell us how the spell that is upon them may be broken!" And immediately the hunter turned from them with an angry look, poured out the milk upon the ground, and went away with his empty goblet.

When the sun grew warm at noon, they went again to drink at the running stream. Then there came through the oaks another hunter, and in his hand he carried an oaken goblet, filled with mead to the brim. This hunter also asked them to drink, told them the stream was full of frogs, and asked them if they were not a young prince and princess. But when Woodwender and Loveleaves answered as before: "We have promised to drink only running water, and are the children of yonder lords; tell us how the spell may be broken!" he turned from them with an angry look, poured out the mead, and went his way.

All that afternoon the children worked beside their fathers, planting acorns with the withered branches; but the lords would take no notice of them or of their words. When the evening drew near, they were very hungry; so the children divided their last cake, and when no persuasion would make the lords eat with them, they went to the

The hunter turned from Woodwender and Loveleaves with an angry look, and poured the wine on the grass.

banks of the stream and began to eat and drink.

The ravens were coming home to their nests in the high trees; but one, that seemed old and weary, alighted near them to drink at the stream. As they ate the ravens lingered, and picked up the small crumbs that fell.

"Brother," said Loveleaves, "this raven must surely be very hungry or it would never come so close to us; let us give it a little bit, even though it is our last cake."

Woodwender agreed, and each gave a bit to the raven; but its great bill finished the morsels in a moment, and, hopping nearer, it looked them in the face by turns.

"The poor raven is still hungry," said Woodwender, and he gave it another bit. When that was gobbled, it came to Loveleaves, who gave it a bit too, and so on till the raven had eaten the whole of their last cake.

Woodwender, catching up his father's spade, ran to the stream and threw it in. Loveleaves did the same for the Lord of the White Castle. The spell was then broken.

"Well," said Woodwender, "at least we can have a drink of water." But just as they stooped down to the water, there came through the oaks another hunter, and in his hand he carried a very large oaken goblet, filled to the brim with wine. He also said:

"Leave this muddy water, and drink with me."

But the children said:

"We will not drink anything except this water, and yonder lords are our fathers; please tell us how the spell may be broken!"

The hunter turned from them with an angry look, poured out the wine on the grass, and went his way. When he was gone, the old raven looked up into their faces, and said:

"I have eaten your last cake, and I will tell you how the spell may be broken. Before the sun sets, go to the lords, and tell them how their stewards used you, and made you mind pigs. When you see them listening, catch up their wooden spades, and keep them, if you can, till the sun goes down."

Woodwender and Loveleaves thanked the raven, and, running to the lords, began to tell as they were bid. As the children related how they had been made to sleep on straw, how they had been sent to mind pigs, the acorn planting grew slower, and at last the lords dropped their spades. Then Woodwender, catching up his father's spade, ran to the stream and threw it in. Loveleaves did the same for the Lord of the White Castle. That moment the sun disappeared behind the western oaks, and the lords stood up, looking, like men newly awake, on the forest, on the sky, and on their children.

Woodwender and Loveleaves went home rejoicing with their fathers. The silk clothes and the best chambers were promptly taken from Hardhold and Drypenny and given to the lords' children again; and the wicked stewards, with their cross boy and girl, were sent to mind pigs.

As for Woodwender and Loveleaves, they met with no more misfortunes, but grew up, and were married, and inherited the two castles and the lands of their fathers. Nor did they forget the lonely Lady Greensleeves, for it was well known in the east country that she and her dwarf Corner always came to feast with them at Christmas-time, and at midsummer they always went to live for a time with her in the great oak in the forest.

THE KING'S DAUGHTER IN THE MOUNTAIN

THE STORY OF CUPID AND PSYCHE

IN the ancient days there lived in Greece a king who had three daughters. Psyche, the youngest daughter, was of remarkable beauty.

When she passed through the streets people threw down flowers for her to walk on. They worshipped her. But when the time came for her to marry, the king was commanded by a mysterious voice to take her to a wild mountain, and leave her there.

"Alas!" cried the people. "Our lovely Psyche is about to be sacrificed!"

And so, indeed, she was. The people had said that Psyche was more beautiful than Venus herself. Now, Venus was the Spirit of Beauty, and, though what the people said was true, Venus was very angry. She had a son named Cupid, who was the Spirit of Love, and she bade him marry Psyche to the ugliest creature on earth.

So when Psyche was placed on the mountain, a wind fairy came and carried her to a strange palace. There the maiden was waited on by unseen spirits, who played sweet music and served her with delicious food. But in the dark night someone came and spoke tenderly to her, and she fell in love with him, and consented to be his wife. Then he said:

"Psyche, you may do what you will in this palace which I have built for you. But one thing you must not do. You must not try to see my face."

He was very sweet and kind to her, but as he came only in the night-time, Psyche felt very lonely in the day-time. One day the wind fairy brought her sisters to see her, and they made her very unhappy. They told her that, by command of Venus, Cupid had married her to a monster.

"That's what your husband is!" they said. "And that's why he will not let you see his face!"

The next night Psyche lighted a lamp, and looked at her sleeping bedfellow. He was Cupid, the winged and radiant Spirit of love! In her joy, Psyche tilted the lamp, and a drop of hot oil fell on his shoulder, and aroused him.

"Ah, Psyche!" he cried. "We must part. My mother will now know that I fell in love with you, and instead of mating you to a monster, married you myself in secret. Farewell!"

And, spreading out his wings, he flew away. In the morning Psyche bravely set out to follow him, and, after sadly wandering over the world, she came to the palace of Queen Venus. There she remained as a servant, in the hope of seeing Cupid. But Venus recognized her, and, being more angry with her than before, she set her on dangerous tasks in order to bring about her death. Psyche, however, was so gentle and lonely and sorrowful that everything on earth took her part and helped her. Then Venus laid a plot against her.

"Take the Golden Casket to the Queen of the Dead," she said, "and ask her to fill it with the magic Ointment of Beauty."

Psyche knew that no mortal had ever returned from the Land of the Dead, and in her despair she climbed a tower to throw herself down and die. But the very stones took pity on her, and said:

"Do not despair. You will find a way to the Land of the Dead on Mount Tartarus. Go there, and take two copper coins in your mouth and two honey-cakes in your hands."

Psyche gladly did so. She came to the Land of the Dead, and a ghostly ferry-man ferried her over the River of Death, and took one of her copper coins. Then a horrible dog with three heads sprang at her, but she fed him with a honey-cake, and he let her pass. The Queen of the Dead filled the Golden Casket, and by means of the last honey-cake and the last copper coin Psyche returned to the green, bright earth.

She then opened the casket to see what was inside. Alas, this was just what Venus had expected she would do! The casket was full of poisonous vapor. This vapor rushed up into Psyche's face and overcame her, and she fell down on the grass. But Cupid had been watching her in all her trials, and he now flew to her aid, and wiped the vapor from her face. Then, taking her in his arms, he spread out his wings, and carried her up to the Land of Immortality. And there they still live together in unending joy.

SPREADING OUT HIS WINGS CUPID FLEW AWAY

Psyche was so beautiful that Venus, the Spirit of Beauty, hated her, and sent Cupid to marry her to the ugliest creature on earth. But Cupid fell in love with her and married her in the dark, forbidding her to gaze on his face. One night Psyche lit a lamp, and when a drop of oil fell on Cupid and awakened him, he fled.

THE WISHING TABLE

A COUNTRY tailor had a goat, and his three sons used to take the goat out to feed in turn.

One day the eldest son took her to a churchyard, where she ate her fill of sweet grass. On the way home again he asked her:

"My goat, have you had enough to eat?" And she answered:

"Not a blade could I touch,
I have eaten so much."

When she was safely back in the stable and the old tailor asked his son if she had had plenty to eat, he replied:

"Not a blade could she touch, she has eaten so much."

The tailor, however, feeling a little uncertain, went to the stable and asked the goat if she had really had enough to eat. To his great amazement, the goat answered:

"How can I but hungry feel,
As round the little graves I steal
And fail to get a proper meal?"

The tailor was furiously angry, and, running to his son, he exclaimed:

"You have told me a lie in saying that the goat had plenty to eat, while all the time she is hungry!"

Then he seized his yard measure, and beat his son out of the house.

The next day the second son took the goat out to pasture, and exactly the same thing happened, with the result that the angry father drove him also out of doors. On the third day the remaining son took the goat out, and the same thing happened again.

The old tailor was now left alone, and had to take the goat out himself. He watched, and saw that she ate well, and towards evening he asked her:

"Have you had enough to eat, goat?" And the goat replied:

"Not a blade could I touch,
I have eaten so much."

Then the tailor took her home and tied her up in the stable; but before leaving her he said:

"Are you quite sure that you have had enough to eat for once?"

Then to his utter amazement, the goat gave the usual answer:

"How can I but hungry feel,
As round the little graves I steal
And fail to get a proper meal?"

The tailor almost fell to the ground with astonishment, and he saw how unjustly he had treated his three sons. He decided to punish the goat, and did this in a very odd way, for he lathered the goat's head all over, and then shaved off all the hair. He next fetched his whip and drove the animal away.

In the meantime the eldest son went to a joiner's shop and spent many months in learning his trade. At the end of his apprenticeship his master, who was pleased with him, gave him a table which, though nothing extraordinary to look at, yet had one very curious quality. If anyone said to it, "Serve up a meal, table," it was instanty covered with a white cloth, with knives and forks, and dishes containing all kinds of nice food.

The young man now saw that he would never want for something to eat, and soon afterwards he decided to go back to his father to see if his anger had passed away. On his way home he had to stay one night at an inn where there were many guests. They invited him to share their supper, but he replied:

"I will give you a supper instead."

Then he set down his table in the middle of the room and said, "Serve up a meal, table," when it at once was covered with dishes of delicious food. All the guests sat down and enjoyed themselves greatly; while the landlord, in a corner of the room, said to himself:

"I could make good use of such a table as that."

After the young man and his friends had gone to bed, the landlord changed the table for another of the same size that he happened to possess; and in the morning the joiner went merrily off, never suspecting that he was carrying the wrong table.

When he reached home his father greeted him with great joy, and asked what that old table meant that he was carrying on his back. The son explained that it was a wishing table, and asked his father to invite a number of his friends, so that they might have proof of the table's power.

As soon as the guests had assembled, the son ordered the table to serve up a meal; but, to his amazement, nothing

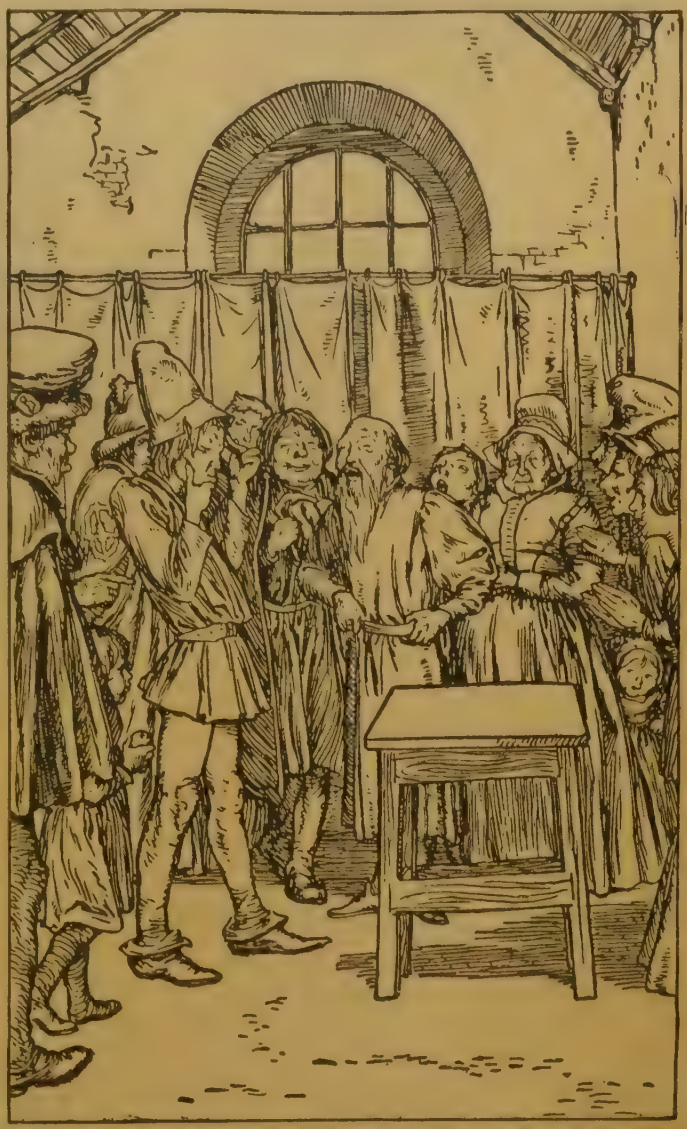
whatever happened. He then saw that the table had been changed, and he was so greatly ashamed of having appeared to deceive his father that he ran away.

Meantime the second of the tailor's sons entered a mill to learn the business. At the end of his apprenticeship the miller made him a present of a donkey, remarking that it was a curious animal, for it would neither carry burdens nor go in harness. "But," added the miller, "this donkey yields gold. You have only to make it stand on a cloth and then call out 'Bricklebrit,' when a shower of sovereigns will fall out of his mouth." The young miller then decided to go back to his father, as he thought he saw his way to be a rich man all the rest of his life. On the way he had also to spend a night at the inn where his brother's table had been stolen.

After supper he asked for his bill, and on feeling in his pocket discovered that he had spent all his money. So he asked the landlord to wait a minute while he went to fetch some. He then started for the stable, carrying a tablecloth with him.

The landlord, being an inquisitive man, slipped out quietly after him, and watched through the keyhole of the stable door. There he saw his visitor spread the tablecloth on the ground, make the donkey stand on it, and at the magic word "Bricklebrit" a shower of sovereigns fell from the animal's mouth. The landlord then went quietly back into the house, where his guest presently joined him and paid his bill. During the night the wicked innkeeper got up, led the golden donkey out of the stable, and put another one in its place.

On reaching home his father welcomed him warmly, but was by no means pleased to see the donkey. On hearing, however, what a wonderful animal this one was, he ran out and called his neighbors and friends together to see the donkey that could make money. The young miller then spread a cloth on the floor, led the donkey into the room, and called out "Bricklebrit." No gold, however, appeared, and the poor young



As soon as the invited guests had all assembled, the eldest son ordered the table to serve up a meal; but, to his amazement, nothing whatever happened.

miller at once saw what a trick had been played upon him. He, in his turn, like his elder brother, was so ashamed that he went away.

But what had become of the younger son? He had apprenticed himself to a turner, and had worked hard to learn the trade. His brothers had written to him, and so he knew about their misfortunes with the table and the donkey.

At the end of his apprenticeship his master gave him a bag, saying:

"You will find a thick club inside it, and if anybody treats you badly, you have only to cry 'Out of the bag, club!' when it will jump out and keep beating your enemy until you say 'Back into the bag, club!'"

Soon afterwards this young man, in his turn, decided to go home. He also stayed at the inn where his brothers had lost their property, and, knowing what had happened, he was determined to punish the innkeeper. So at supper-time he put the bag on the table, and, without opening it, said that he had a treasure in it worth more than all the wishing tables and golden donkeys in the world. The covetous landlord, thinking that the bag must be full of diamonds, decided to get hold of them.

By and by the young man went to bed, and put the bag under his head for a pillow. When the landlord thought he was asleep, he crept softly into the room and began gently pulling at the bag. The young turner, who was really wide awake all the time, suddenly exclaimed, "Out of the bag, club!" and in a moment the stick was out and was soundly thrashing the landlord.

The young man sat laughing at him, and presently said:

"The club will never stop beating you until you give me the wishing table and the golden donkey."

The landlord was so exhausted with pain that he was glad enough to give up the stolen goods.

The next day the young man went home to his father, sent for his two brothers, and gave them back their property. Showers of sovereigns fell from the golden ass's mouth, and the wishing table was no sooner placed in the room than it was seen to be covered with a splendid meal. The poor old tailor had no more need to work, and he and his three sons lived in luxury and happiness ever after.

The goat who had caused all the trouble was so ashamed of her shaven head that she crept into a fox's hole. When the fox returned he was alarmed at the sight of this bald-headed creature with two horns, and ran off to his neighbor, the bear. The bear said that he would soon fetch it out, whatever it was; but one sight of the fiery eyes of the goat made him take to his heels. Just then a bee came along, and, hearing that some terrible creature was sitting in the fox's hole, he undertook to drive it out. So, settling on the shaven head of the goat, he stung her so violently that she fled away, and has not been heard of since.

THE TREASURE OF RHAMPSINITUS

ONCE upon a time there was a king in Egypt whose name was Rhampsinitus, who had so much money that he was afraid it would get stolen; so he sent for a clever mason and made him build a very strong room to hold all the treasure.

But he did not know that the mason had put one stone in the wall which he knew how to take out quite easily. Now, when the mason died he told his sons about the stone, and so they used to come by night and carry off as much money as they wanted, putting the stone back.

King Rhampsinitus was very angry when he found that there was less money every time he went to the treasure-house; so he put a trap there. One night one of the brothers was caught in the trap. So he said to the other: "The king will certainly put me to death, and you cannot save me. But if you will cut my head off and take it away, no one will know who I am, and you will be safe." So the other brother cut his head off, and took it away, and buried it. But he very much wanted to bury the body, too, because the Egyptians cared very much about burying their dead properly.

Now, Rhampsinitus guessed that someone would try to get the body, and he hoped by that to find out who it was that had helped the dead man to rob him. So he had the body hung up in chains, and set some soldiers to watch.

Then the other brother brought a donkey past the place with two wine-bottles on its back, which were made of skins, in the Egyptian fashion. Just as he was passing, he opened one of the skins, so that the wine began to run out, and he set up a great outcry. Then the sentinels came to help him, and he pretended to be very grateful, and gave them the other wine-skin. But the wine in that was drugged, and the sentinels were very soon asleep; whereupon he carried off the body. But the soldiers were afraid to say that they had gone to sleep, and so they declared that the body must have been carried off by magic.

King Rhampsinitus was puzzled, but he hit upon what he thought was a clever idea. He made a proclamation that his daughter had made up her mind to marry the man who could give the best answer to some questions; but the suitors must all come to talk to her in the dark, so as to make sure that she made her choice without knowing who they were. But he told the princess that she was to make each suitor tell her the cleverest thing he had ever done.

Of course, the mason's son wanted to try his hand, but he expected that there was a trap of some sort.

So he made himself a dummy hand which felt just like a real hand if you took hold of it, and went to try his luck with the princess. Of course, when she asked her question, he said the cleverest thing he had done was tricking the guards. Now, this was just what Rhampsinitus had wanted.

"Dear me," said the princess, "that *was* clever! I shall choose you; give me your hand."

But the mason's son suspected her because of the way she said it, and in the dark he gave her the dummy hand, and immediately slipped out before she knew what had happened. Then Rhampsinitus saw that the robber was such a very clever person that he made another proclamation in which he declared that he should not only be granted a free pardon, but should really and truly marry the princess.

And the story says that the mason's son did marry the princess, and they lived happily to a good old age.

TALES TOLD BY THE INDIANS

THE ICE MAN AND THE GREAT FIRE

ONCE when the red men were in the woods a spark from their fire set the trees ablaze, and burned them until the flames went down to the roots, making a great hole in the ground. Still the fire blazed away, and the hole got deeper and deeper, so that at last the red men feared the whole world would be burned up. Then they sought the Ice Man, who lives in the North.

"Oh, Ice Man," said they, "help us to put out the fire, or all the world will be burned up."

"Go back to the wood," answered the Ice Man, "and I will come to-morrow."

The messengers returned, and the next day, while they were watching for the Ice Man, there came a cold wind from the North. But this only seemed to fan the flames still higher and fiercer. Then the raindrops began to fall gently.

Then the wind became a whirlwind, and the rain became snow and hail, and, as they beat upon the fire, the flames became smoke and the red-hot rock became smouldering embers, and at last the fire went out, and the world was saved. And now where the great hole was burned in the ground there is a large lake.

WHY THE SNOW COMES

The North went on a journey, and, after going a very long way, came to the South, where he fell in love with the South's daughter and asked for her.

"Oh, no!" said the South. "You cannot wed my daughter, for ever since you came here the weather has been so cold that we are all likely to freeze to death."

"Let me marry your daughter," said the North, "and take her to my home."

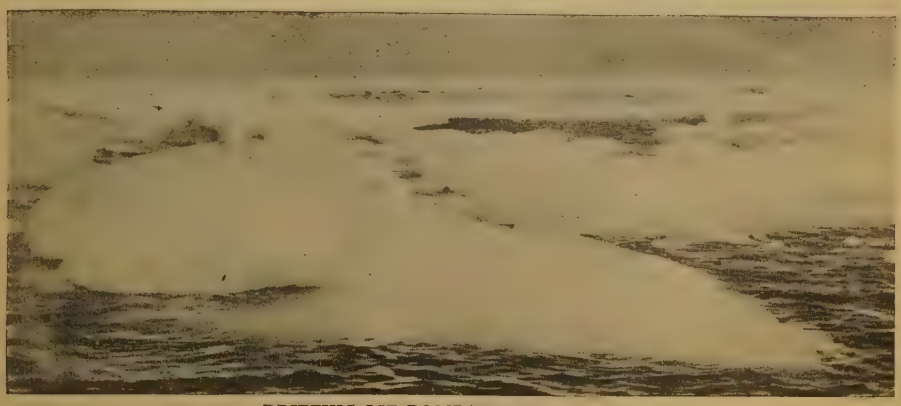
At last the South consented, and the North took back his bride to his own country, where the people lived in ice houses. But she had not been there long before the sun rose, the air grew warm, and the ice began to melt. Then the people of the North said that the bride must go back to her father, or they would have no homes left; and, although the North loved the daughter of the South, she had to return to her father's house, where sometimes the North visits her, and brings the winter snows.

THE NEXT STORIES ARE ON PAGE 1985.

CANADIAN OUTPOSTS IN THE ARCTIC

BAFFIN'S BAY, SHOWING NORTHERNMOST INHABITED HOUSE IN AMERICA

ALBERT HARBOR, ALBERT LAND, IN THE ARCTIC REGIONS



DRIFTING ICE BOMBARDS THE COAST

UNKNOWN CANADA

CONTINUED FROM 1771

IF there is any part of Canada which is unknown, how can I tell you anything about it? When I speak of parts of Canada as unknown, perhaps a better way of putting it would be to say "little known." And that is really what I mean. A very large part of the Dominion is little known in the sense that travelers have crossed it here and there, leaving wide stretches of country between their paths which have never been trodden by white men. Still other parts are absolutely unknown and unexplored.

You will, perhaps, think it very strange that nearly two-thirds of Canada is almost unknown to-day, and uninhabited save by bands of wandering Indians and a few Esquimaux. Yet northern Canada is an unexplored country in a sense which is not true even of Africa, and this for several reasons. The Canadian explorer in the north lands has to meet a very cold climate for the larger part of the year, and it is possible to live in such a climate only by being well provided with food, shelter and fuel.

But in northern Canada the food supply is very uncertain, as you can never tell where the wandering bands of caribou may be, and in the depth of winter they all go south. Fish can usually be obtained, but only at certain places, and even there they sometimes fail the starving fisherman. Fuel is another very important necessity, and over a large part of the country northwest of Hudson Bay it is wholly lacking.

You may say: "Why not leave the work of exploration until warm weather comes?" First, because the summer lasts for such a short time—probably not more than two or three months—and in that time it is possible only to touch the fringe of the unknown country. And in summer the bogs and swamps are nearly or quite impassable, whereas in the cold weather King Frost makes them dry and firm.

UNGAVA, OR THE NEW QUEBEC

If you turn to a map of Canada, you will see a great triangular block of land between Hudson Bay on the west and the Atlantic Ocean on the east. If the map is a recent one, this huge country will be included in the Province of Quebec, of which it now forms a part. The true name is Ungava, or New Quebec, as some people now prefer to call it. Others call it Labrador, or the Peninsula of Labrador. It is truly a peninsula, as your map will show you; but it is not Labrador, for Labrador is the narrow strip

Copyright, 1913, 1918, by M. Perry Mills.

of land along the Atlantic side of the Peninsula, and it belongs, not to Canada, but to Newfoundland. You will find a description of the true Labrador in the article on Newfoundland.

In 1891 Mr. Packard, the well-known naturalist, wrote: "The Labrador Peninsula is less known than the interior of Africa or the wastes of Siberia." Since that time several exploring expeditions have told us something about the interior of this huge territory, but what Mr. Packard wrote in 1891 is still true to-day. However, the call of the unknown has a great attraction for many men, who do not hesitate to risk life and health to learn its secrets. One of them, Mr. Hubbard, lost his life from starvation in Ungava, but this did not stop his old friend, and even his wife, from continuing the search.

We learn from the writings of the government geologists and others, that Ungava is a tableland about 2,000 feet high, and that it slopes toward Hudson Bay and the Arctic Ocean. The Atlantic coast is much higher, and the rivers which flow into the Atlantic have worn deep ravines through the rocks and earth. These ravines are sometimes hundreds of feet deep and are very beautiful. The whole interior of the country is covered with a network of rivers and lakes.

This fact makes it possible to use canoes, but as many of the rivers are shallow and very rapid, the canoes and food have to be carried for long distances. And the great number of rivers makes it easy to get lost, for such maps as we have are poor, and a person is quite likely to go astray in a country where the rivers and lakes are so plentiful and look so much alike. Then, too, unless you carry with you enough food to last your journey, you may starve to death, for wild animals cannot be depended upon for food, and every fisherman knows that fish will not always take the fly or allow themselves to be caught in other ways.

THE PEOPLE OF UNGAVA

In the whole of Ungava there are probably no more than 3,000 people, and most of them are Indians. In the winter they live by hunting and trapping, but they generally move toward the coast for fish during a few weeks in the summer. The traps of one man may extend for a distance of fifty miles over the snowy wastes, and it often takes him several days to visit them all. Many a time he finds nothing but bits of fur to reward him for all his toil, a sure sign that the sly and hungry wolverine has stolen a march upon him.

The Indians' great source of food has always been the caribou, but unfortunately they are fast being exterminated. These rather stupid animals move north in the summer, south in the winter, and the Indians hunt them while they are on their journeys. Then they travel in large herds, and these are most numerous at the shallow parts of rivers which they must cross. Here the Indians meet them, and great is the slaughter. But the real work of the Indians is trapping the fur-bearing animals, the skins of which they carry to the coast in the summer and sell to the fur-traders.

Will Ungava ever be a white man's land? It is hard to say. The soil is not good for farming, and the winters are very cold, but there are valuable forests, and there may be minerals. It is safe to say, however, that there will never be many white people there, though the country itself may bring a good deal of wealth to the older part of the Province of Quebec.

THE YUKON TERRITORY—THE GOLD COUNTRY

In the extreme northwest of Canada, a large territory, or district, has been separated from the Northwest Territories and is now known as the Yukon Territory. Here we find the famous Klondike mining camp, so well known, but a few years ago, for its valuable gold deposits. This country is most easily reached by boat from San Francisco, Seattle, or Vancouver, to Skagway at the head of the Lynn Canal, thence by rail to White Horse, and thence down the Yukon River to Dawson City, the most important centre in the Territory.

At the height of the gold rush, this was a busy little town, but, with the decrease in the gold output, it has lost a great many of its people, as has also the whole Territory, whose population of over 27,000 in 1901 had decreased to 8,500 in 1911. At first the gold was obtained by washing the soil in and near the river beds, a method known as placer mining. Now real mines are being sunk, and though there is less waste, the yield is much less while the cost at first is

SUMMER IN THE FAR NORTH

While some of the land in the Yukon is fertile, there are also scenes like this. Note the seams of rock of a different sort which have been forced up by some convulsion of nature. Evidently an avalanche has swept this side of the mountain. Notice the deep snow piled on the top.

Turn to your map of the Northwest Territories and look for the Great Slave Lake. Just where the Great Slave River flows into it is Fort Resolution, a post of the Hudson's Bay Company. The goods which the Indians are bringing from the landing will be exchanged for furs.

Photographs from Brown Bros.

greater and the miners do not make so much money as in the early days.

So, for the time being, the story of the Yukon has become to a great extent a story of the past, a past when fortunes were made in a few weeks, and still larger fortunes lost for ever. Such is nearly always the tale of mining countries, for a country cannot live by gold alone.

Of far greater interest is the chance that some day this territory may offer other and better methods of supporting the people who may go there. Here, as in the case of Ungava, we have to confess that we know little of the other kinds of wealth which the country may have.

We do know, however, that the southern part has a milder climate in winter than has the interior of Ungava, for while Ungava is washed on its northern and eastern borders by the cold Arctic currents, and on the west by the stormy waters of Hudson Bay, the Yukon is blessed with the warmer winds from off the great Pacific. The west coasts of all the continents are warmer than the eastern, and in this respect the Yukon is no exception to the rule.

The geological explorers tell us that the southern part of the Yukon, or a large part of it, is neither too cold nor too barren for the hardier grains and vegetables. Parts of it, too, are well wooded, but as long as there are other and more fertile portions of the Dominion to be had for the asking, and as long as the magnificent forests of British Columbia are left to us, we cannot expect that many people will choose the Yukon as a home. At present, in addition to the Indians, who live by trapping, hunting and fishing, the few white people in the Yukon are found either at the fur-trading posts or are engaged in mining.

THE NORTHWEST TERRITORIES

The Northwest Territories include all that part of the Canadian mainland which is not contained in the nine provinces or in the Yukon. They are bounded on the east by Hudson Bay, on the south by the enlarged province of Manitoba, Saskatchewan, Alberta, British Columbia, on the west by the Yukon Territory, and on the north by the Arctic Ocean. The southwestern portion of this area, particularly the valley of the Mackenzie River, is by all odds the most valuable.

In this part, trees are found in the valleys of the rivers almost as far north as the Arctic Ocean, and the hardier grains and vegetables can be grown nearly as far north as the trees extend. But we can never expect other than a sparse population here, except, perhaps, in the extreme south and near the rivers and lakes. The Mackenzie River itself is a very large stream, in places extremely beautiful. The most uninteresting part of its course is near its mouth, where the ground is low and marshy, and no trees grow.

Coal of poor quality is found in many places along its banks. Petroleum and natural gas are likewise found. Many years ago, when drilling for oil, gas was struck by the prospectors. The pressure was so great that it was impossible to stop the flow, and, to make matters worse, it was set on fire, and has been burning ever since, day and night, summer and winter alike.

THE BARREN LANDS

Most of the eastern part of the Northwest Territories is well named the Barrens, or Barren Lands. They are entirely bare of trees, and in winter the only wild animals found there are the musk-ox and wolverine, while the only sample of bird life is the ptarmigan, which is said to be found only where it is cold enough to freeze mercury. On their southern border, these Barren Lands are bounded by stunted trees, the northern limit of which extends toward the northwest from a point on Hudson Bay near Fort Churchill, to a point near the mouth of the Mackenzie River.

The trees are small and withered, like decrepit old men. An added touch of sadness and misery is given by the garments of "caribou" moss in which many of them are clothed. Farther south they are of course much larger and more vigorous, but the short summers and long winters of the north give them little chance to grow, so that a hundred years' growth on the border of the Barrens is perhaps no more than ten years' in the southern parts of Canada.

THE AWAKENING OF SUMMER

Following the long winter's sleep, the first warm days of summer—for there is no spring—make a great change in the Barrens. Large herds of caribou,

PEOPLE OF THE HUDSON BAY COUNTRY

ESQUIMAU GROUP ON THE GREAT WHALE RIVER

TYPES OF THE HUDSON BAY PEOPLE

BOAT BUILDERS AT FORT GEORGE, HUDSON BAY

These three pictures show us some of the types one may see in the great "unknown land" around Hudson Bay. We feel that their lives are full of hardship, but if they can secure food and clothing, they ask for little more. The caribou and other animals furnish the greater part of their food, and they are able to get, in exchange for the furs they have taken, enough of the white man's goods to satisfy their few remaining simple wants. These people have many good qualities, as all the visitors and explorers testify, though, of course, their ideas are not those of the white man. Whether civilization would make them happier is a doubtful question.

Photographs from Brown Bros

which have spent the winter within the forest border, start on their summer journey toward the north, where their young are born. Geese, ducks, and other birds arrive from the south in immense flocks, and are soon busy feeding their little ones. Wild flowers of the hardier kinds are in bloom, and the moss which covers the Barrens starts into life.

THE REIGN OF WINTER

But this lasts only for two or three short months, for in September or October, winter starts his long reign again. The icy winds sweep down from the north, storm follows storm, and the Barrens are again left to the few musk-oxen, which still roam the wilds, and the hardy ptarmigan, for whom the cold has no terrors. The first visitors to leave are the summer birds, followed soon after by the caribou on their journey to the woods, which give them some protection from the harsh winter.

THE ESQUIMAUX AND INDIANS

At the extreme north of this inhospitable land, along the Arctic coast, the Esquimaux manage to support themselves during the whole year. In the winter they live in houses built of blocks of ice or snow, unlighted and unwarmed, save by a seal-oil lamp or stove, for it serves the purpose both of a lamp and stove. Though explorers have been glad to accept their hospitality, their manner of life seems unbearable to us, especially during the depths of winter, when for weeks at a time the sun never shows his face above the horizon, and the nights are but little darker than the days.

On the other hand, at midsummer the sun never sets, so that there is constant daylight for some weeks. All this of course is true only within the Arctic circle where the Esquimaux live. And even winter's gloomy days are not entirely dark and dreary, for then the Northern Lights flash their gorgeous signals over King Frost's domain.

The Indians, unlike the Esquimaux, spend the most of the winter in the more hospitable west, but in the summer they make numerous raids into the Barrens to hunt the caribou, whose flesh forms their principal food. Even in the early winter, they are sometimes forced to leave their homes for the same purpose, and to bring in the supplies of caribou meat which have been left behind during the summer's hunt.

THE LACK OF FUEL

The principal reason why the Barrens are a terror to the winter explorer is because there is no wood there for fuel, and so it must be carried from the border on dog-sleds. Now wood is very bulky, and only a small quantity can be taken. Therefore the winter journey into the Barrens must be a very short one. Many and many an Indian, after burning his tent poles and every scrap of wood, has in the end died miserably in this unhappy country. A few white men have made short dashes into the Barrens in winter, but their adventures have been far from pleasant.

Many have been attracted by the desire to see and hunt the musk-ox, that strange-looking beast, half sheep, half ox, the numbers of which are fast becoming less and less as the years roll by. Others have traveled across the Barrens on exploring expeditions, either sent by the government, or led by that love for the unknown which we all feel more or less. These men have generally traveled in summer as much as possible, and have followed the watercourses in their canoes.

The lines of rivers and lakes which our maps of the Barrens show are the roads followed by these brave men. We know nothing about the vast area of land and water between these roads, but we can guess that it is not very different from the country which has been described by the travelers, and so we say that it is all equally barren and forbidding. There is a chance that minerals may yet be found there, but the chance is rather a poor one, as, so far, the geologists have seen nothing very promising.

THE ISLANDS OF THE ARCTIC OCEAN

Quite recently, expeditions have been sent by water around the Atlantic coast to the islands in the Arctic Ocean beyond the Canadian mainland. It is pleasing to the pride of some Canadians to think that these islands have been taken possession of in the name of the King, but it is hard to see in what way they can ever be of any use. A few Esquimaux are found there, but probably white men will never be content to make their homes in these bleak, rocky fortresses.

THE NEXT STORY OF CANADA IS ON PAGE 2273.

This is what our skin is like ; if we cut a finger where it is marked with a cross, this is how the cut would look if magnified. The surface of the skin, on the right, shows the ridges greatly enlarged.

THE SKIN AND ITS USES

CONTINUED FROM 1805

SOME of us may think, perhaps, that the skin is not a very interesting part of the body, but that is very far from being the case. Even if we were only to think of the skin as a material, and were to compare it with silk or indiarubber or paper or cloth, we should find that it is far more wonderful than any of these, and that nothing which human beings can make is equal to it. But it is indeed far more than a material, for it is alive, and besides being the covering of our bodies, it is one of the instruments by which the brain is made acquainted with the outer world.

We know that if we do not have enough light, growth is interfered with, and the blood becomes pale. Also, we breathe more deeply under the influence of light ; and it has been proved that in a fixed time animals take in more oxygen and give out more carbon dioxide in the light than they do in the darkness. This is due to the effect of the light on the brain ; but it is not a direct effect, for the brain itself lives in darkness. It is due to the way in which certain nerves running to the brain are affected by light.

These are the nerves of the eyes and the nerves of the skin in general. For instance, an animal does not breathe so well or deeply if its eyes are bandaged. But the eyes are not alone responsible for helping the brain. The skin, also, has something to do with it, and this is true even though we can see by the eyes and not by the skin. It is good, then, to expose our faces and our hands to the light ; and sometimes, when people are ill, they are helped to get well again by taking what are called sun baths, when they take off their clothes and expose the skin to the light. It is the action of the light on the skin that also helps to make bathing in the open air so pleasant and healthful. It is probably rather a drawback to us that we cover up nearly the whole of our bodies so that light cannot play upon the skin ; but it is, at least, well that we should live in the light as much as possible, and let our faces and hands be exposed to it.

We must particularly remember that it is sunlight or daylight to which, through long ages, our bodies have become adapted. It is a great pity we do not use all the daylight we can. We suffer in health and strength through getting up many hours after the sun, and living by artificial light after the sun has set. Our bodies were certainly meant to live in the open air and in the light of day. Even the best ventilated building is not as good as open air, and the best kind of artificial light is not as good as daylight.

Now we may pass on to look at the way in which the skin is made, and

we may notice some facts about it which we can all see for ourselves without special means. In the first place, the skin is perfectly elastic. If this were not so we could not move our bodies; for every time we move, the skin is stretched somewhere, and then, by its elasticity, returns to its first position. Anyone can see this for himself by pushing the skin on the back of his hand into folds, and seeing how perfectly it comes back again. One or two cases have been described where people had skin which had lost its elasticity, and they found it as difficult to move as if they had been cased in stiff armor with no joints.

How it is that our faces tell something about our characters

Even the most elastic thing in the world, however, has limits to its power, and this is true of the skin. We notice that as the years pass the skin of the face begins to show lines and folds according to the way in which it has been moved. This depends upon our feelings. The bright and happy person shows his feelings by moving the skin of his face in a particular way; so does the person who is always thinking; so does the person who is gloomy and always worries. In the course of time lasting marks are made in the skin of the face, telling us something about the character of the person. The best kind of beauty of the skin lasts all one's life, and depends upon the kind of life we have lived. Age makes it only more beautiful.

One of the marks of age in the skin is that it loses its elasticity. Often, also, it becomes very thin. In extremely old people the wrinkles that used to be present in the face often disappear, and the skin becomes thin and smooth. But we must pass to other features of this wonderful material.

Why the skin is the most wonderful waterproof material in the world

The skin has a very beautiful texture. This has been compared to velvet, to the skin of a peach, and so on; but there is nothing else which has all the qualities of the surface of the skin when it is well cared for and has not been too much exposed to rough weather. We are so made that this gives us pleasure. Everyone likes to rub his finger against the cheek of a child, for there is nothing else that feels quite so nice. Another most important feature of this material is that it is waterproof, but in one direction only. By means of certain special arrangements in the skin, it is able to take water from the blood and allow it to escape; but water cannot enter through the skin, not even through the little channels by which the sweat, or perspiration, comes out. It is, of course, most important that the skin should be waterproof, and yet it is also most important that it should be able to remove water from the blood, as we shall see. It would be hard to find any other material allowing water to pass through it in one direction, while being perfectly waterproof in the other direction.

The first use of the skin that occurs to anyone is, of course, that it protects all the tissues underneath it from dirt. If the outside of the skin were itself alive, it would be bound to suffer very seriously from the dirt which it so often encounters; but almost the most remarkable thing about the skin is that, though it is a product of life, yet the outside of it is not really alive, just as the tip of a nail is not really alive.

The outer skin that is not alive, and the inner skin that is alive

The outside of the skin, indeed, is made of very much the same material as the nails are made of, or the hoofs of a horse, or various kinds of horns. Every time we wash—indeed, every time the skin is rubbed at all—a great deal of its outer layer is rubbed off. When we come to study the skin closely we find that it may quite distinctly be divided into two layers, an outer and an inner layer. The Latin name for the skin is *dermis*, and the inner layer of the skin is called the dermis, or true skin. It is really alive; it bleeds when it is pricked, and it hurts when it is touched. The layer that lies outside it is called the *epidermis—epi* simply meaning *upon.*

This epidermis is made by the dermis, and is being constantly renewed from moment to moment as it is rubbed off. It has no feeling in it, for there are no nerves in it, and it can be rubbed off, or can even have a needle passed through it without bleeding, for it has no blood-vessels in it. You know that it is

quite easy to pass a needle through the skin at the tip of a finger without feeling anything, and without drawing any blood. The epidermis is very thick there, and you simply pass the needle through that. It is the epidermis that grows over the base of the nails. If you are reading very carefully, you will say that anything which grows must be alive, and we have just said that the epidermis is not alive. That is perfectly true. The thin skin that grows on the base of the nail is not alive, and does not grow itself. It is really pushed from behind by the new cells which the true skin is forming behind it.

How the skin is ever changing & the living cells push upwards and die

The whole skin is made of cells—both the true skin and the outer skin, or epidermis. The cells of the true skin are alive, and when they grow to a certain point they divide into two, and make new cells. This goes on always. It is in the deeper layers of the skin that it goes on; and so it happens that the cells which have been already made are pushed upwards and outwards towards the surface by the young cells formed beneath them. After a time the old cells die; they become thin and flat and horny, and it is they that form the epidermis, or outer skin. They protect the true skin, and the whole of the rest of the body. A great deal of dirt from outside soaks into them, but soon they are rubbed away, and other cells take their places. In this way we are able to keep the surface of the body clean from day to day. The true skin contains much more in it besides the cells which grow and divide and make the epidermis, but the epidermis itself has no other structures in it, and nothing more need be said about it.

The little tubes that carry off the water from our bodies

Any part of the body which has the business of making special fluids is called a gland; glands in the stomach, for instance, make the digestive juices. Now, we find that the true skin contains a large number of glands which have a special purpose; they are called sweat-glands, and consist simply of a long coiled tube, the end of which passes through the epidermis, and opens on the surface of the skin. This tube is lined with cells, and outside them is a rich supply of capillary blood-vessels. In every part of the skin we find these sweat-glands, and they are working nearly all the time. We must not think that we sweat, or perspire, only when we can see visible drops standing on the skin. That only happens when the sweat-glands are very actively at work. But even during an ordinary day, when you have never noticed at all that you are perspiring, the skin discharges about 25 ounces of sweat.

If we desire to examine sweat to find what it is made of, we must go to some part of the skin where there is no hair, for hairs have little glands of their own which are of a different kind. You will guess for yourself, then, that the place to go to is the palm of the hand or the sole of the foot, where no hair is to be found in anybody. When we examine the sweat thus obtained, we find that it is 99 per cent. water; the remaining 1 per cent. is made up of a number of things, including common salt. Sweat is slightly acid when it is produced.

The stream of water constantly flowing through the body

In course of time the watery part of sweat passes into the air as water-vapor, but the solid part is left upon the skin, as the salts of sea-water are left in the sea when the water passes into the air. Even the cleanest skin contains many microbes, and some of these act upon the solids that are left from the sweat, so that they are changed into something else that is unpleasant. This is one of the chief reasons for keeping the skin clean.

The production of sweat is one of the most useful things that the skin does. Some of the solids of sweat are poisonous substances that the body needs to be rid of, so that the skin, through its sweat-glands, is one of the channels, like the lungs, by which we dispose of the waste products of our lives. But we must not think that there is no use in the 99 per cent. of water that is found in sweat. For one thing, it is good in itself that there should be a constant stream of water through the body, because water helps most chemical actions, and also because it helps to dissolve and carry away

things we do not want. But the water in the sweat has a special use which is of great importance.

It is necessary for the health of all the higher animals, and specially necessary for our health, that the temperature of the body should be kept at a fixed point, no matter whether it is summer or winter, day or night.

How our bodies are kept cool in summer and warm in winter

There must be some way, then, of regulating the temperature, and this is done mainly by means of the sweat. In very hot weather it is necessary for us to keep cool. The body must lose much heat somehow or its temperature will rise above the fixed point necessary for our health. So we produce a great deal of sweat, as everyone knows, and when the water in it leaves the skin it takes away a great deal of heat from our bodies. The same thing happens even if we put water on the skin from the outside. If, next time you wash your hands, you dry only one of them, you will very soon find that what we call the evaporation of the water from the wet hand makes it much cooler than the other. Then, on a very cold day, when we need to keep all the heat we can, we perspire only very slightly. Thus, the figure quoted above—25 ounces per day—is only an average figure. The amount of sweat produced depends chiefly upon the body's need for heat.

You must have noticed a dog lying panting, with its mouth wide open, on a very hot day. The dog has sweat-glands only on the skin of the pads of its feet, and so it practically cannot use our method of keeping cool on a hot day. That is why it suffers so much from the heat, and has to breathe quickly so as to get rid of as much water as possible by its lungs.

What happens when the weather is what we call "close"

Then, again, you must have noticed how uncomfortably hot you become when the weather is what we call "close." On another day the sun may be as hot or hotter, yet we do not feel oppressed at all. The reason is that on the days which we call close, or muggy, there is a great deal of water already in the air. Now, the more water there is in the air, the more slowly can it take up any extra water. Indeed, sometimes the air may be so full of water that it will practically take up no more. This means that the sweat cannot evaporate from the skin, and so we cannot become cool in this way. We are as badly off for the time as the dog, which can scarcely sweat at all. But on other days, though the heat of the sun may be intense, and though the air around us may be just as hot, yet it may happen to contain only a little moisture, and so our sweat evaporates quickly, and keeps us cool, and we do not find the heat oppressive at all.

Now, there must be some way in which the sweat-glands are controlled. There must be some centre which orders them to act as they are needed. This is so. The sweat-centre lies in the lower part of the brain, and from it nerves proceed which carry its orders to the millions of sweat-glands in the skin. Then, when the blood becomes too hot, the sweat-centre in the brain which has the hot blood passing through it gives an order, and the sweat-glands are set in vigorous action. There are various other ways in which the sweat-centre may be disturbed; for instance, a person may sweat in great fear, even when he is quite cold.

Drugs that act on the tiny sweat-centre in the brain

But sometimes the sweat-centre is poisoned and does not act properly. For instance, during fever, the blood is too hot, and it is very desirable that we should sweat; yet the skin is both hot and dry. There are many drugs, known which prevent sweating, and some which produce sweating. The most remarkable of these comes from an African plant, and a mere fraction of a grain of it will make the skin simply run with perspiration. Then there is another drug which comes from the plant called the deadly nightshade, and a still smaller dose of that will prevent all sweating for many hours. In both cases these doses are so very tiny that they could not possibly act as they do if they had to be spread out over all the sweat-glands. But they act on the tiny sweat-centre in the brain, and that is why so little of them can produce such powerful results. A little whisper in the king's ear may do more than much shouting in the streets.

THE NEXT PART OF THIS IS ON PAGE 1981.

A CHILDREN'S POEM BY WORDSWORTH

IN the poetry of William Wordsworth there is much tender sentiment expressed in simple words which the youngest reader could not fail to understand. His poetry is at times not of a very high order, though he is capable of the best; but it is always redeemed by tender and just sentiment. That may be said of his poem "The Pet Lamb." The poet says "the dew was falling fast." Now, the dew does not fall; it rises. But this is what we call "poetic license." As poetry is not the mere statement of fact, but the expression of the imagination, it must not be bound by the same rules as the describing of a machine. The poet is allowed to use words that suggest to the mind ideas and pictures which, though not strictly true, may be more beautiful than fact, and all such departures from the mere fact are called "poetic license," meaning that the poet has taken this liberty for the sake of poetic effect.

THE PET LAMB

CONTINUED FROM 1876

THE dew was falling fast, the stars began to blink;
I heard a voice; it said, "Drink, pretty creature, drink!"
And looking o'er the hedge, before me I espied
A snow-white mountain lamb, with a maiden at its side.

Nor sheep nor kine were near; the lamb was all alone,
And by a slender cord was tether'd to a stone;
With one knee on the grass did the little maiden kneel,
While to that mountain lamb she gave its evening meal.

The lamb, while from her hand he thus his supper took,
Seem'd to feast with head and ears; and his tail with pleasure shook:
"Drink, pretty creature, drink!" she said in such a tone
That I almost received her heart into my own.

'Twas little Barbara Lewthwaite, a child of beauty rare!
I watch'd them with delight; they were a lovely pair.
Now with her empty can the maiden turn'd away;
But ere ten yards were gone, her footsteps did she stay.

Right towards the lamb she look'd, and from that shady place
I unobserved could see the workings of her face;
If nature to her tongue could measured numbers bring,
Thus, thought I, to her lamb that little maid might sing:

"What ails thee, young one—what? Why pull so at thy cord?
Is it not well with thee—well both for bed and board?
Thy plot of grass is soft, and green as grass can be;
Rest, little young one, rest; what is't that aileth thee?

"What is it thou wouldst seek? What is wanting to thy heart?
Thy limbs, are they not strong?—and beautiful thou art!
This grass is tender grass; these flowers they have no peers,
And that green corn all day is rustling in thy ears.

"If the sun be shining hot, do but stretch thy woollen chain;
This beech is standing by, its covert thou canst gain;
For rain and mountain storms, the like thou need'st not fear,
The rain and storm are things that scarcely can come here.

"Rest, little young one, rest; thou hast forgot the day
When my father found thee first in places far away;
Many flocks were on the hills, but thou wert own'd by none.
And thy mother from thy side for evermore was gone.

"He took thee in his arms, and in pity brought thee home;
A blessèd day for thee!—Then whither wouldst thou roam?
A faithful nurse thou hast; the dam that did thee yean
Upon the mountain-tops no kinder could have been.

"Thou know'st that twice a day I have brought thee in this can
Fresh water from the brook, as clear as ever ran;
And twice in the day, when the ground is wet with dew,
I bring thee draughts of milk, warm milk it is and new.

"Thy limbs will shortly be twice as stout as they are now,
Then I'll yoke thee to my cart like a pony in the plough!
My playmate thou shalt be; and when the wind is cold
Our hearth shall be thy bed, our house shall be thy fold.

1925

"It will not, will not rest!—Poor creature, can it be
That 'tis thy mother's heart which is working so in thee?
Things that I know not of belike to thee are dear,
And dreams of things which thou canst neither see nor hear.

"Alas, the mountain-tops that look so green and fair!
I've heard of fearful winds and darkness that come there;
The little brooks that seem all pastime and all play,
When they are angry, roar like lions for their prey.

"Here thou need'st not dread the raven in the sky;
Night and day thou art safe—our cottage is hard by.
Why bleat so after me? Why pull so at thy chain?
Sleep—and at break of day I will come to thee again!"

As homeward through the lane I went with lazy feet,
This song to myself did I oftentimes repeat;
And it seem'd, as I retraced the ballad line by line,
That but half of it was hers, and one half of it was *mine*.

Again, and once again, did I repeat the song;
"Nay," said I, "more than half to the damsel must belong!—
For she look'd with such a look, and she spake with such a tone,
That I almost received her heart into my own."

GINEVRA

This poem in blank verse by Samuel Rogers tells simply one of the most dramatic stories that could be conceived. The legend of the awful chest is told of several English houses, but is probably of Italian origin. Let us hope it never was true. But the tale contains a warning to us to act always with prudence, and exercize forethought, even when jesting.

IF thou shouldst ever come by choice or chance
To Modena, where still religiously
Among her ancient trophies is preserved
Bologna's bucket (in its chain it hangs
Within that reverend tower, the Guirlandine),
Stop at a palace near the Reggio gate,
Dwelt in of old by one of the Orsini.
Its noble gardens, terrace above terrace,
And rich in fountains, statues, cypresses,
Will long detain thee; thro' their arched walks,
Dim at noonday, discovering many a glimpse
Of knights and dames, such as in old romance,
And lovers, such as in heroic song,
Perhaps the two, for groves were their delight,
That in the springtime, as alone they sat,
Venturing together on a tale of love,
Read only part that day. A summer sun
Sets ere one half is seen; but ere thou go,
Enter the house—prythee, forget it not—
And look a while upon a picture there.
'Tis of a lady in her earliest youth,
The very last of that illustrious race,
Done by Zampieri—but I care not whom
He who observes it, ere he passes on,
Gazes his fill, and comes and comes again,
That he may call it up when far away.
She sits, inclining forward as to speak,
Her lips half open, and her finger up;
As tho' she said, "Beware!" Her vest of gold
Broider'd with flowers, and clasped from head to foot,
An emerald stone in every golden clasp;
And on her brow, fairer than alabaster,
A coronet of pearls. But then her face,
So lovely, yet so arch, so full of mirth,
The overflowings of an innocent heart—
It haunts me still, tho' many a year has fled,
Like some wild melody!
Alone it hangs
Over a mouldering heirloom, its companion,
An oaken chest, half eaten by the worm,
But richly carved by Antony of Trent
With Scripture stories from the life of Christ;
A chest that came from Venice, and had held
The ducal robes of some old ancestor.
That by the way—it may be true or false—
But don't forget the picture; and thou wilt not
When thou hast heard the tale they told me there.
She was an only child; from infancy
The joy, the pride of an indulgent sire.
Her mother dying of the gift she gave—
That precious gift—what else remained to him?
The young Ginevra was his all in life,
Still as she grew, for ever in his sight;
And in her fifteenth year became a bride,
Marrying an only son, Francesco Doria,
Her playmate from her birth, and her first love.
Just as she looks there in her bridal dress,
She was all gentleness, all gaiety,
Her pranks the favourite theme of every tongue.
But now the day was come, the day, the hour;
Now, frowning, smiling, for the hundredth time,
The nurse, that ancient lady, preach'd decorum;
And, in the lustre of her youth, she gave
Her hand, with her heart in it, to Francesco.
Great was the joy, but at the bridal feast,
When all sat down, the bride was wanting there.
Nor was she to be found! Her father cried,
"'Tis but to make a trial of our love!"
And filled his glass to all; but his hand shook,
And soon from guest to guest the panic spread.
'Twas but that instant she had left Francesco,
Laughing, and looking back, and flying still,
Her ivory tooth imprinted on his finger.
But now, alas! she was not to be found;
Nor from that hour could anything be guessed,
But that she was not!
Weary of his life,
Francesco flew to Venice, and forthwith
Flung it away in battle with the Turk.
Orsini lived; and long might'st thou have seen
An old man wandering as in quest of something,
Something he could not find—he knew not what.
When he was gone, the house remain'd a while
Silent and tenantless—then went to strangers.

Full fifty years were passed, and all forgot,
When on an idle day—a day of search
'Mid the old lumber in the gallery,
That mouldering chest was noticed; and 'twas said
By one as young, as thoughtless as Ginevra,
"Why not remove it from its lurking-place?"
'Twas done as soon as said; but on the way
It burst, it fell; and lo! a skeleton,
With here and there a pearl, an emerald stone,
A golden clasp, clasping a shred of gold.
All else had perished—save a nuptial ring,
And a small seal, her mother's legacy,
Engraven with a name—the name of both—
"Ginevra."
There then had she found a grave!
Within that chest had she concealed herself,
Fluttering with joy, the happiest of the happy;
When a spring-lock that lay in ambush there
Fastened her down for ever!

THE QUEEN & THE FLOWERS

Since the fourteenth century England has had a Poet Laureate originally chosen from the poets of the day to celebrate the great events in the history of the country, but who is no longer under any such obligation. The following poem, from "Fortunatus, the Pessimist," was written by a former Poet Laureate, Mr. Alfred Austin, who died in the year 1913. He here retells in simple tuneful verse an old and beautiful legend.

THERE was a king in olden days
With black heart, scowling forehead.
The mighty trembled at his gaze,
And his sceptre was abhorréd.

Alike to burgher and to boor
His grasp was hard and greedy:
He had no pity for the poor,
Indulgence for the needy.

Beside him sat a gentle queen,
Compassionate and holy,
Who fed the hungry, clad the mean,
And comforted the lowly.

Till with harsh words he her forbade
To visit, cheer, or aid them.
Then meekly, though her heart was sad,
She listened, and obeyed them.

It happed, one day, in hovel rude
A leper lay a-dying;
And there was none to take him food,
And none to soothe his sighing.

Forgetting all, with bread and meat
She filled a little wallet,
And, sallying out into the street,
Made haste to reach his pallet.

When lo! the king, with courtiers girt,
Came riding through the city.
The queen in terror raised her skirt,
To screen her work of pity.

Seeing her shrink and bow her head,
His brow began to pucker:
"Now show me what it is," he said,
"You hide below your tucker."

She spoke not, but uncovered it;
And look what it discloses!
Not wheaten loaf and dainty bit,
But myrtles, pinks, and roses.

"What gauds are these?" he fumed and cried,
"And wherefore were they hidden?"
"I disobeyed you," she replied,
And trembled to be chidden.

"Food was I taking where, ah, me!
A lonely leper cowers;
But the Lord Jesus, as you see,
Hath changed them into flowers."

The king dismounted from his horse,
First smelt pink, rose, and myrtle,
Then knelt, and, smitten with remorse
Kissed her white hands and kirtle.

Henceforth he held no sumptuous state
In courtyard, hall, or stable;
The poor were welcomed at his gate
The hungry at his table.

When died his queen and in the tomb
Was laid with pomp and wailing,
Myrtle at once began to bloom,
And climb round slab and railing.

And even when the snow lies white,
And frosty stars are shining,
Clove pinks about her grave are bright,
And round it roses twining.

TO THE CUCKOO

William Wordsworth's ode to the cuckoo may be compared with that of Michael Bruce. Perhaps the most beautiful idea in Wordsworth's poem is the fourth line of the first verse.

O BLITHE new-comer! I have heard,
I hear thee and rejoice:
O Cuckoo! shall I call thee bird,
Or but a wandering voice?

While I am lying on the grass
Thy twofold shout I hear;
From hill to hill it seems to pass,
At once far off and near.

Though babbling only to the vale
Of sunshine and of flowers,
Thou bringest unto me a tale
Of visionary hours.

Thrice welcome, darling of the Spring!
Even yet thou art to me
No bird, but an invisible thing—
A voice, a mystery.

The same whom in my schoolboy days
I listen'd to; that cry
Which made me look a thousand ways
In bush, and tree, and sky.

To seek thee did I often rove
Through woods and on the green;
And thou wert still a hope, a love;
Still long'd for, never seen!

And I can listen to thee yet;
Can lie upon the plain
And listen, till I do beget
That golden time again.

O blessed bird! the earth we pace
Again appears to be
An unsubstantial fairy place
That is fit home for thee!

A SONG OF THE CAMP

"A Song of the Camp" by Bayard Taylor has such a wonderful swing and pathos to it that it fairly carries us off our feet.

"GIVE us a song!" the soldiers cried
The outer trenches guarding.
When the heated guns of the camp allied
Grew weary of bombarding.

The dark Redan, in silent scoff,
Lay grim and threatening under;
And the tawny mound of the Malakoff
No longer belched its thunder.

There was a pause. A guardsman said:
"We storm the forts to-morrow;
Sing while we may, another day
Will bring enough of sorrow."

They lay along the battery's side,
Below the smoking cannon;
Brave hearts from Severn and from Clyde,
And from the banks of Shannon.

They sang of love, and not of fame;
Forgot was Britain's glory;
Each heart recalled a different name,
But all sang "Annie Laurie."

Voice after voice caught up the song,
Until its tender passion
Rose like an anthem, rich and strong,—
Their battle-eve confession.

Dear girl, her name he dared not speak,
But, as the song grew louder,
Something upon the soldier's cheek
Washed off the stains of powder.

Beyond the darkening ocean burned
The bloody sunset's embers,
While the Crimean valleys learned
How English love remembers.

And once again a fire of hell
Rained on the Russian quarters,
With scream of shot and burst of shell,
And bellowing of the mortars!

And Irish Nora's eyes are dim
For a singer dumb and gory;
And English Mary mourns for him
Who sang of "Annie Laurie."

Sleep, soldiers! still in honoured rest
Your truth and valour wearing;
The bravest are the tenderest,—
The loving are the daring.

THE AMERICAN FLAG

All Americans owe a great debt of gratitude to Joseph Rodman Drake for writing the stirring poem entitled "The American Flag." The swinging verses cannot fail to crea e a glow of real feeling in every true patriot of the broad la .d.

WHEN Freedom, from her mountain height,
Unfurled her standard to the air,
She tore the azure robe of night,
And set the stars of glory there!
She mingled with its gorgeous dyes
The milky baldric of the skies,
And striped its pure celestial white
With streakings of the morning light,
Then, from his mansion in the sun,
She called her eagle-bearer down,
And gave into his mighty hand
The symbol of her chosen land.

. . . . . .

Flag of the seas! on ocean's wave
Thy star shall glitter o'er the brave;
When Death, careering on the gale,
Sweeps darkly round the bellied sail,
And frightened waves rush wildly back
Before the broad-side's reeling rack,
The dying wanderer of the sea
Shall look, at once, to heaven and thee,
And smile, to see thy splendours fly,
In triumph, o'er his closing eye.

Flag of the free heart's hope and home,
By angel hands to valour given!
Thy stars have lit the welkin dome,
And all thy hues were born in heaven!
And fixed as yonder orb divine,
That saw thy bannered blaze unfurled,
Shall thy proud stars resplendent shine,
The guard and glory of the world.
For ever float that standard sheet!
Where breathes the foe but falls before us?
With Freedom's soil beneath our feet,
And Freedom's banner streaming o'er us!

DOUGLAS, DOUGLAS, TENDER AND TRUE

This well-known poem was written by Dinah Maria Mulock.

COULD ye come back to me, Douglas, Douglas,
In the old likeness that I knew,
I would be so faithful, so loving, Douglas,
Douglas, Douglas, tender and true.

Never a scornful word should grieve ye,
I'd smile on ye sweet as the angels do;—
Sweet as your smile on me shone ever,
Douglas, Douglas, tender and true.

O to call back the days that are not!
My eyes were blinded, your words were few;
Do you know the truth now up in heaven,
Douglas, Douglas, tender and true?

I never was worthy of you, Douglas,
Not half worthy the like of you;
Now all men seem to me like shadows—
Douglas, Douglas, tender and true.

Stretch out your hand to me, Douglas, Douglas,
Drop forgiveness from heaven like dew,
As I lay my heart on your dead heart,
Douglas,
Douglas, Douglas, tender and true.

AS DOWN IN THE SUNLESS RETREATS

This poem by Thomas Moore shows him in a different mood from his other verses we have quoted in our BOOK OF POETRY.

AS down in the sunless retreats of the ocean
Sweet flowers are springing no mortal can see,
So, deep in my soul, the still prayer of devotion,
Unheard by the world, rises silent to thee,
My God, silent to thee,—
Pure, warm, silent to thee.

As still to the star of its worship, though clouded,
The needle points faithfully o'er the dim sea,
So dark when I roam, in this wintry world shrouded,
The hope of my spirit turns trembling to thee,
My God, trembling to thee,—
Pure, warm, trembling to thee.

LIKE a blind spinner in the sun
I tread my days;
I know that all the threads will run
Appointed ways;
I know each day will bring its task,
And, being blind, no more I ask.

HELEN HUNT JACKSON.

THE LORELEI

"The Lorelei" was written by the German poet, Heine. The Lorelei was a siren maiden who with her singing beguiled poor sailors to their death on the rocks of the River Rhine.

I KNOW not what sorrow is o'er me,
What spell is upon my heart;
But a tale of old times is before me—
A legend that will not depart.

Night falls as I linger, dreaming,
And calmly flows the Rhine;
The peaks of the mountains gleaming
In the golden sunset shine.

A wondrous lovely maiden
Sits high in glory there;
Her robe with gems is laden,
And she combs out her golden hair.

And she spreads out the golden treasure,
Still singing in harmony;
And the song has a mystical measure,
And a wonderful melody.

The boatman, when once she has bound him,
Is lost in a wild sad love:
He sees not the black rocks around him,
He sees but the beauty above.

I believe that the billows springing
The boat and the boatman drown;
And that this, with her magical singing,
The Lorelei has done.

AFAR IN THE DESERT

This poem was written by Thomas Pringle, a Scotchman who went to live in South Africa. In these verses he gives us the Call of the Wild as only one who knows can give it.

AFAR in the desert I love to ride,
With the silent Bushboy alone by my side,
When the wild turmoil of this wearisome life,
With its scenes of oppression, corruption, and strife—
The proud man's frown, and the base man's fear,
The scorner's laugh, and the sufferer's tear,
And malice, and meanness, and falsehood, and folly
Dispose me to musing and dark melancholy;
When my bosom is full, and my thoughts are high,
And my soul is sick with the bondman's sigh,—
Oh, then there is freedom, and joy, and pride,
Afar in the desert alone to ride!
There is rapture to vault on the champing steed,
And to bound away with eagle's speed,
With the death-fraught firelock in my hand,—
The only law of the Desert Land!

. . . . . .

Afar in the desert I love to ride,
With the silent Bushboy alone by my side,
Away, away, in the wilderness vast
Where the white man's foot hath never passed,
And the quivered Coranna or Bechuan
Hath rarely crossed with his roving clan,—
A region of emptiness, howling and drear,
Which man hath abandoned from famine and fear.

. . . . . .

Where grass, nor herb, nor shrub takes root,
Save poisonous thorns that pierce the foot;
Where sedgy pool, nor bubbling fount,
Nor tree, nor cloud, nor misty mount,
Appears, to refresh the aching eye;
But the barren earth and the burning sky,
And the blank horizon, round and round,
Spread,—void of living sight or sound.
And here, while the night winds round me sigh
And the stars burn bright in the midnight sky
As I sit apart by the desert stone,
Like Elijah at Horeb's cave, alone,
"A still small voice" comes through the wild
(Like a father consoling his fretful child),
Which banishes bitterness, wrath, and fear,
Saying,—Man is distant, but God is near!

When Columbus landed in what he called the West Indies, the people he found there were the Caribs, but these people have nearly all died out now. The West Indies to-day are largely peopled by descendants of the African negroes who were taken there as slaves. The ancestors of this family were, no doubt, slaves.

Further India is made up of what was once the Burmese Empire and part of the Malay Peninsula. The people, like millions of other Asiatics, live chiefly on rice, which they prepare by threshing the stalks. Upper photograph, copyright by B. L. Singley.

WHAT THIS STORY TELLS US

WE have read the stories of India, of the British dominions on the continents of Africa, North America, and Australia; and of the smaller colonies on those continents, as well as the big islands which lie close to them. But there is still a great deal more of this wonderful empire of theirs. There is a big territory in Asia, east of India, sometimes called Further India; and the large island of Ceylon, at the southern tip of India itself. Besides this, we have all been told that "Britannia rules the waves!" and that means that there are far more British ships and British sailors on every part of the ocean than any other nation can show; and there are also an immense number of islands, scattered all over the ocean, big and little, fruitful and barren, which have become little bits of the British Empire; and here and there are little spots—on the coast of Spain, and in Arabia, and in China—where the British flag flies. We read of these places here, completing our story of the British Empire.

OUTPOSTS OF THE BRITISH EMPIRE

CONTINUED FROM 1786

SOME of these places are real colonies, where British people have made homes, or live in order to carry on trade. Others are kept because Great Britain feels she must have fortified harbors of her own all over the world to which her fleets may repair, and ports from which they can get the stores they require when they need to remain a long time at sea.

Now, there is no sheet of water where it is more important to keep a strong fleet than the Mediterranean Sea. England found that out when Oliver Cromwell was Protector, and Robert Blake was his great admiral. At that time she had no port on the continent of Europe. Calais had been lost a hundred years before, and it was not till Cromwell had been dead for nearly fifty years that Admiral Rooke captured the Rock of Gibraltar from Spain. It was taken in 1704, and since then has remained in British hands. It is a strongly fortified port, and able to hold the Mediterranean open to the British fleet.

It is only a little bit of barren rock thrusting itself out into the sea, but it is of priceless value for all that. Once for three long years the French and the Spaniards besieged it, just at the time when England was fighting our ancestors in America; but the garrison held out grimly, and when the war ended the British flag was still flying over the Rock, and flies there to this day. There are two islands in the Mediterranean which must come into this story. One of them belongs to Great Britain, while the other belonged to Turkey until the outbreak of the Great European War. The first of these is Malta.

Hundreds of years before England began to have a history, this island of Malta was used by the great trading nations of the countries around, and they have left their images, pottery, and tombs to mark their presence. About the time that the Romans began to conquer Britain, in the first century after Christ, St. Paul was shipwrecked on the island. Later came dark times of pirates and Arabs, who were driven out about the times when the Normans had conquered England and were making the Domesday Book to show who owned the land. The people of Malta speak a language derived from the ancient Phœnician tongue.

The name of the chief town of Malta, Valetta, recalls a hero, one of the Knights of St. John, a brotherhood which had banded together to defend the sacred city of Jerusalem, and to resist the Turks in every possible way. These knights did much for the island, making fine fortifications and bringing shiploads of earth from Sicily, the better to grow food on this sun-smitten, rocky island. It was in 1565 that Valette, the Grand Master of the knights,

defended the island with great courage against the Turks, and the new city that arose on the ruins of the old one was called after him.

Over two centuries later the island fell into the hands of Napoleon, and later Nelson blockaded it. In the end it passed to the British, who greatly desired the island for its fine harbor, and for its value as a storehouse and a headquarters for the Mediterranean Fleet. Like Gibraltar, Malta has become doubly valuable since the opening of the Suez Canal.

British watch-towers and forts in the Mediterranean and the Red Sea

The second island in the Mediterranean is Cyprus. Great Britain paid Turkey a sort of rent for it, and attended to the trade and the management of the island, finding it useful as a watch-tower from which to observe what was going on at that far end of the Mediterranean near the Suez Canal. In 1914, when Turkey entered the war, Great Britain annexed the island.

When you have passed through the canal and sailed down the Red Sea, you come to another spot marked red. This is Aden, a strongly fortified harbor and coaling station in Arabia, which guards the mouth of the Red Sea, as Gibraltar guards the mouth of the Mediterranean. Here are batteries of heavy guns placed on the hard, dry rocks surrounding the town, which is a centre for trade in coffee, feathers, hides, and skins. Perim, a bare little island at the entrance of the Red Sea, is a coaling station; and Socotra is a larger island in the Indian Ocean, with mountains of granite and a bare soil. Arabs live on the island of Socotra, and it is valuable only because of its position on the most important road to India.

Lonely island peaks rising from the bed of the oceans

Far down the Indian Ocean is the island of the Mauritius, which used to belong to France; but the French ships there were so troublesome that the islands were seized during the war with Napoleon. This is another of the places which is kept chiefly for protection in time of war.

Two lonely mountain peaks, 800 miles apart, once active volcanoes, rise from the bed of the Atlantic, away on the western side of Africa, and form the islands of Ascension and St. Helena. During the years when the British and Dutch were busy trying to sweep each other off the seas, the British managed to capture St. Helena, which contains only 47 square miles. One of its chief points of interest is that, when the great Napoleon was defeated at Waterloo, he was taken to this lonely island and kept there in exile till he died, so that he should not again upset the peace of Europe.

Ascension Island, about two-thirds the size of St. Helena, was taken after Waterloo, and is often spoken of as a fixed store ship. Little grows on the island, and sea-turtles are the only article of trade. These islands are outposts, convenient for the ships which have to remain for a long time on the high seas.

These two islands are in what you may call the African part of the Atlantic Ocean—they are nearer to Africa than to America. But most of the islands in the Atlantic are nearer to America.

The chain of fairy-like islands where Columbus is supposed to have landed

Look well at the great semi-circle of islands that stretch from Florida in North America to the mouths of the Orinoco River in South America. They are the highest parts of a mountain chain whose lowest slopes are at the bottom of the deep, deep sea. The smaller islands are often only the very tops of the submarine mountains, but the larger islands rise high enough above the sea to have mountains upon them much higher than any mountains in the United Kingdom. Quite a number of these belong to the British Empire.

This curious ridge of islands reminds us of the way in which the islands lie grouped to the east of Australia, also in or near the Tropics, the hottest belt of the earth. Here, also, in the warm seas of the West, we find the same little builders without hands, forming coral barriers and reefs and countless beautiful fairy-like islands, very little raised above the surface of the crystal-clear sea.

It was on one of these coral islands, in the group called the Bahamas, that Columbus is supposed to have first landed. This is how he wrote of them: "It seemed to me that I could never

leave so enchanting a spot, and as if a thousand tongues would fail to describe it."

Travelers of to-day agree with him. Many invalids go from the United States and elsewhere to enjoy the beauty of those islands and their healthful winter climate. They never tire of the lovely walks in the flower-covered woods, or of boating in the clear waters of the beautiful bays. Oranges, bananas, pines, all grow in this chain of 500 islands, which stretches for nearly 800 miles. Only twenty of the islands have people living on them.

THE ISLANDS COLUMBUS MISTOOK FOR INDIA, AND CALLED THE WEST INDIES

The Bahamas, of which the British took possession a long time ago, look on the map as if they were a sort of fringe to the row of big islands which lie next to the south of them—Cuba, which is like a cigar (and a great many cigars come from it); and Haiti, which is sometimes called San Domingo, and sometimes Hispaniola, which means Little Spain; and Porto Rico. These are not part of the empire; but close to them there is a fourth big island, Jamaica, which is British. To the east there is a long string of smaller islands, stretching all the way from Porto Rico to the coast of South America, nearly all of which belong now either to France or to Great Britain. The whole of the sea which is girdled by all these islands is called the Caribbean Sea; and all the islands together are spoken of as the West India Islands, or the West Indies.

These names were given because the first Europeans who set foot on those lands were the sailors of Christopher Columbus. Now, when Columbus sailed across the Atlantic, what he expected to reach was not a new continent, but India; and so he, and the adventurers who followed after him, called all the native tribes of this new world "Indians," both in South America and in North America.

THE LAST STAND OF THE CARIBS

The tribes who were found in the islands were the Caribs and Arawaks. The Arawaks were gentle and peaceful; but the Caribs were a fierce and warlike race, some of whom killed and ate prisoners whom they took in battle. We get our word "cannibal" from their name.

The fate of these islanders was very hard. Many were killed in wars with the newcomers. Many perished when compelled to toil in the mines on the mainland—a task for which they were quite unfitted. There is a thrilling story told about a last stand made by some of the Caribs in Grenada, one of the Lesser Antilles. The fight was on the top of a high cliff, and when further resistance was useless, one after the other they leaped from it into the sea far below. There are few natives left in the islands now, though there are many Caribs on the mainland.

If we look at the west end of the Caribbean Sea, we find on the mainland, at the beginning of the isthmus which joins North and South America, one red patch a little bigger than Jamaica. This is British Honduras. Eastwards, just to the south-east of the last of these islands, on South America itself, there is another red patch, which is British Guiana. Out in the Atlantic Ocean, nearly six hundred miles south-east of Cape Hatteras, lies a group of small islands which are also British. These are the Bermudas, where many people from the United States and Canada go to spend a winter vacation.

THE LARGEST ISLAND OF BRITISH WEST INDIES, AND SOME SMALLER ISLANDS

Jamaica, the "land of wood and water," in the tongue of the natives, is the largest of the islands belonging to Great Britain—not quite so large as Connecticut. There are at least thirty good harbors. Ships homeward bound from them bring in many West India products, especially sugar and bananas.

When the weather is too hot and damp round the coast, all Europeans who can do so go up to the beautiful country in the Blue Hills, where the air is fresh and the woods cool and shady.

A great many of the smaller islands in the curved chain between Porto Rico and Trinidad are volcanic peaks, with very fertile soil, in which grow many productions that need heat. The scenery is very picturesque with jagged peaks, beautiful woods, and in many cases fields like rich gardens. Limes, from which a refreshing drink is made, grow in Montserrat. St. Kitts and Nevis send sugar; Antigua sends over pineapples. There is a fine harbor in

St. Lucia, and another in Grenada, from which is sent much cocoa. Barbados, a little more than twice the size of Staten Island, has a large and industrious population and a healthy climate. There are good schools, and a university at Bridgetown, which is a real tropical "garden city."

THE BEAUTIFUL ISLAND OF TRINIDAD, WHICH SENDS ASPHALT FOR OUR ROADS

Trinidad, about the size of Delaware, is also a beautiful and fertile island. The great wonder of the island is its asphalt lake which astonished Sir Walter Raleigh when he landed there, and used the pitch to fill the seams of his ship. Quantities of the black sticky mass are brought to this country for use on our roads and streets. One of the great features of the West Indies is the numbers of points of communication that they have with the hot inside of the earth. Often there are serious earthquakes, and the old capital of Jamaica was overwhelmed by one not very many years ago.

As for volcanoes, perhaps there is no part of the world, except Java, where there are more gathered together than round the Caribbean Sea. Every now and then, through the centuries, one or another of these chimneys of the mighty furnace below bursts into active eruption. Quite lately this happened in the French island of Martinique.

WHAT HAPPENED IN TWO MINUTES ON THE ISLAND OF MARTINIQUE

At ten minutes to eight one morning a thick, dark cloud was noticed above the head of Mont Pelee. At eight minutes to eight the town clock of St. Pierre stopped. It had only taken two minutes for the black cloud to roll down the sides of the mountain, a vivid flash leaped from it, and in a moment flames burst out in every direction. The beautiful woods on Mont Pelee were left mere blackened stumps, and 32,000 people lay dead under the ruins and ashes of St. Pierre.

The Bermuda Islands are small in size, and produce chiefly vegetables, lilies, and arrowroot. Their great value is in their splendid harbors for shipping. In St. George there is a large dock for repairing ships which was built on the Tyne and towed across the Atlantic to the Bermuda dockyard. There is a cable from Nova Scotia, which passes by Bermuda to Jamaica, and from there on to the West India islands.

British Honduras, about the size of Massachusetts, is the only British possession in Central America. It is noted chiefly for its forests, from which a great deal of mahogany is exported. Most of its people are negroes and Indians, and there are some descendants of the buccaneers.

British Guiana, nearly as large as Oregon, is the only British possession in South America. There is a low, swampy plain near the sea, producing chiefly sugar, the best kind of which is known as Demerara. The mountains behind are covered with forests. These mountains catch the winds laden with moisture, and the very heavy rainfall gives magnificent full rivers, which dash over the tremendous cliffs, one of them over 800 feet high.

THE STORY OF THESE ISLANDS BEFORE THE LANDING OF COLUMBUS

Now, of all these places history has nothing to tell us before the time when Christopher Columbus saw the Bahamas and landed on San Domingo; and then, if any people inhabited the islands, they were the Arawaks and Caribs. For many a year after that none but Spaniards tried to settle there, for they claimed that all the New World belonged to them. But if on any of the islands the Spaniards saw hope of getting wealth with little labor, they settled there, and the natives for the most part were slain or carried off to be slaves, and so died out, and the labor was done for the Spaniards chiefly by negro slaves from Africa.

For years, Spain held possession, but at last others began to dispute her claim. At first, the English made no settlement, though English seamen went out and fought the Spaniards, and seized their treasure-ships. It was not until about 1609 that the English took possession of the Bermudas, which until then were uninhabited. These are the islands which it is supposed Shakespeare meant when he wrote in the "Tempest" of "the still vexed Bermoothes." Just before that time England had seized Barbados, and after 1625, many planters settled there. The work of the plantations was chiefly done by negroes, but thousands of people who had been

convicted of crimes or offences in Great Britain were sent out as bondsmen; some for life, and some for a term of years. Jamaica was taken when Cromwell was at war with Spain. And in the eighteenth century, when Great Britain was at war with France, and sometimes with Spain, too, many islands were captured and recaptured by one or the other. In the end many of the French islands, and some that were Spanish, like Trinidad, fell to the British because their navy was the stronger. But because Spaniards and French and British all alike employed so much slave labor in those tropical lands, the most part of the population to this day is made up of the descendants of negro slaves and of half-castes.

In the Pacific Ocean, too, there are many lovely islands, and some that are not lovely, which the British have settled at some time since Captain Cook made those voyages about a century and a half ago, of which we have read.

The surrender of the island of Malta to the British troops in the last year of the eighteenth century.

Here, too, the natives are dark skinned, and still not far from being savages, as Captain Cook found them. And then we come to Australia, and to the Malay Archipelago, where the Dutch were the first settlers. When the trade of the Indian seas was opened, a little more than three hundred years ago, the British sought the Indian trade, while the Dutch took to what were called the Spice Islands, because of the spices which grow there. But because the trade in those regions is valuable, England

The Spanish officers and soldiers leaving Gibraltar after its capture by the British and Dutch fleet.

bought some lands from native rulers, and obtained others, such as Malacca and Singapore, from the Dutch by exchange.

On the north of China there is a spot called Wei-hai-wei, which the Chinese have leased to Great Britain for as long as Japan shall hold Port Arthur. China has some rights of government in this territory. And on the south coast of China is the little island of Hong Kong, which England got from the Chinese in the early part of last century for a port, partly for the sake of trade with China, and partly for her warships, and here the people are Chinese.

Hong Kong has prospered so greatly since it became a British possession that now there are nearly thirty-five times as many inhabitants as there were when it was Chinese. The Chinese Government wanted to prevent foreigners from trading, and would not protect them; but they promised to let their own people come to Hong Kong to buy and sell, and so merchants from all parts of the world come there to

trade with the Chinese. That is how the place has grown so greatly.

THE BRITISH DOMINIONS OF FURTHER INDIA AND CEYLON

Last of all, we come to the British dominions which are outside of India, but still are very closely connected with it—Ceylon, the big island, and what is called Further India. The government of Ceylon is separate from that of India. The island belonged to the Dutch for 140 years, but when in 1796 Holland had to take sides with Napoleon, Great Britain took it away from them and kept possession. The natives are closely related to the races who lived in India before the Aryans came there; and most of them are of the Buddhist religion, which had its origin in India, but afterwards almost disappeared from that country, though it spread beyond the Indian borders all over the east of Asia. At one time Ceylon produced a great deal of fine coffee, but its place has been taken by a good quality of tea. Large numbers of cocoa-nuts are grown, and the rubber plantations of Ceylon have of late years become famous. Ceylon has a great harbor called Colombo.

Further India is made up of the different parts of what was once the empire of Burma and part of the Malay Peninsula. The peoples are made up of a mixture of the yellow-skinned Malays, who are often called Lascars, and Singalese, like the people of Ceylon, and others who are more nearly related to the Chinese, with round, brown, flat faces and black hair. Most of the Burmese are Buddhists, and the country is covered with those queer-shaped temples which are called pagodas. The Burmese emperor used to be called the Lord of the White Elephant, because of the white elephants which were, so to speak, sacred to him. About a hundred years ago the emperor threatened to make war on the British in India, and became so troublesome that England made war on him, and took away some parts of his territory which lay on the coast. Just before the Indian Mutiny she made war on him again, and took more territory; and at last, in the time when Lord Dufferin was Viceroy of India, Theebaw, the King of Burma, was so troublesome and governed so badly that Lord Dufferin thought there was nothing to do but to put an end to Theebaw's rule altogether and annex all Burma—that is, to bring it under British rule and treat it as a part of India. So that Burma is now a part of India.

THE AIM OF BRITISH RULE IN ALL PARTS OF THE WORLD

All the other places about which we have been reading are either military stations under a military governor or what are called Crown Colonies; that is, they do not govern themselves by means of Parliaments and Ministers chosen by the people, but have governors appointed over them. For self-government is only possible where there is a large enough white population to make sure that the natives would not get the upper hand in the Parliaments and use their power to destroy the British rule. But the great thing for the British to remember is that the aim of their rule should always be to maintain justice and order, and to help the peoples over whom they rule to be prosperous. And so long as this continues the British Empire will remain strong, but if ever they forget this and turn to oppressing the subject peoples for their own advantage, the British Empire will vanish away like the great empires of the ancient world.

THE NEXT STORY OF COUNTRIES IS ON PAGE 2067.

The Rock of Gibraltar, on which the British flag flies at the entrance to the Mediterranean Sea.

THERMOMETERS

CONTINUED FROM 1855

HAVE you ever seen temperature expressed in Centigrade degrees and wondered how many degrees Fahrenheit that meant?

Thermometers, you know, are simply instruments for measuring temperature. Most of them are made of a glass tube containing clear mercury. When heat is applied to solids, liquids or gases they become larger; and when the heat is removed they become smaller again. If the glass and mercury both increased alike when a certain amount of heat is applied, then the liquid would not rise in the tube. But since mercury swells seven times as much as the glass does, the liquid expands and rises in the tube when it is warmed; and when cooled it contracts and sinks down again. It has been found that pure ice will melt at a constant temperature and that water boils at a constant temperature, when the pressure is one atmosphere.

To find the freezing-point the tube is placed in melting ice, and the spot in the tube where the mercury becomes stationary is noted and a mark made in the stem at that point. The boiling-point is then found by putting the bulb and stem in the steam rising from boiling water, and the place at which the mercury stops is marked. The space between these two points, and the part below the freezing-point, are then divided up and marked.

Fahrenheit Thermometer.

There are several kinds of thermometers, as you may read on page 4395. The one we know best is called the Fahrenheit. This was made about two hundred years ago in Holland by a man named Gabriel Daniel Fahrenheit. Here the freezing-point is marked 32 and the boiling-point 212. He took the temperature of a mixture of ice and salt and marked it zero. You see it is possible to have water several degrees below the freezing-point without actually making ice. Fahrenheit found that as soon as ice began to form the temperature always rose to the same point and that a mixture of ice and snow with pure water always gave the same temperature. The top point in his scale indicates the boiling point. Between the two fixed points, which are 32° and 212°, there is an interval of one hundred and eighty degrees. Fahrenheit's scale with its zero below the freezing-point is still used in the United States and England, and in other countries where English is spoken.

Centigrade Thermometer.

Another thermometer, called the Centigrade, is used in many parts of Europe, and by scientists all over the world. It is very popular as it is easy to use. The Centigrade scale, as its name indicates, is divided into a hundred degrees. The word comes from the Latin, centum, a hundred, and gradus, a degree. In this thermometer the freezing-point is marked 0, and the boiling-point 100.

The difference between the freezing-point and the boiling-point of water is 100° on the Centrigrade thermometer and 180° on the Fahrenheit scale. Therefore 5° Centigrade is equivalent to 9° Fahrenheit. So you see 1° Centigrade must equal 9-5 of 1° Fahrenheit. If a Fahrenheit thermometer reads 70° the actual temperature is really 70—32, or 38° Fahrenheit above the freezing-point; but 38° Fahrenheit equals 9-5 of the corresponding Centigrade reading, which is 21 1-9° Centigrade.

So you see there is a very simple way to change a given number of degrees Fahrenheit into Centigrade, as follows: subtract 32 from the number, multiply the result by 5, and then divide by 9. For instance, if you know that the Fahrenheit thermometer reads 104°, and you wish to find how many degrees Centigrade is expressed, first subtract 32 from 104, which gives 72. Then multiply that result, 72, by 5, which gives 360, and divide by 9, which leaves 40°, which is the equivalent Centigrade reading.

Copyright, 1918, by M. Perry Mills.

To reverse the process and change degrees Centigrade into Fahrenheit, multiply by 9, divide by 5, and add 32. For example, how many degrees Fahrenheit is equivalent to 100° Centigrade? To find the answer, first multiply 100 by 9, which gives 900, divide by 5, which gives 180, and add 32 which gives 212°.

Each degree of the Centigrade scale equals 1.8° Fahrenheit, as the Centigrade zero is at the freezing-point, or 32° Fahrenheit. Five degrees Centigrade are equivalent to 9° Fahrenheit or 41° on the Fahrenheit thermometer, and the point marked 10° on the Centigrade scale corresponds to the point marked 50° on the Fahrenheit scale.

The rule which you follow in changing degrees of one thermometer to those of the other may be expressed in this way:

$$F=C\times 9\text{-}5+32 \text{ or}$$
$$C=5\text{-}9\ (F-32).$$

Reaumur.

The Reaumur thermometer is another kind which is different from both the Centigrade and Fahrenheit. It was made by a Frenchman in 1730 and is used in Spain and some parts of Germany. In Reaumur's thermometer, the space between the freezing-point and the boiling-point of water is divided into 80 equal parts, and zero is placed at the freezing-point. To change a certain number of degrees Fahrenheit into Reaumur, first subtract 32 from the number, then multiply the result by 4, and finally divide by 9. For instance, you may wish to change 104° Fahrenheit into Reaumur by this method. If so, first subtract 32 from 104, leaving 72, then multiply 72 by 4 and you will have 288. Divide this by 9 and you will have 32° Reaumur. So that 32° Reaumur is equal to 40° Centigrade and 104° Fahrenheit.

To change Reaumur into Fahrenheit, multiply by 9, divide by 4, and add 32. For example, to find what 80° Reaumur equals in the Fahrenheit scale, follow this method. First multiply 80 by 9, which gives 720, divide this by 4 which gives 180, and add 32 and you will have 212°. The formula which you use may be expressed in the following way:

$$F=R\times 9\text{-}4+32.$$

Alcohol Thermometer

As the mercury in the tube will freeze at about 40° below the zero point in the Fahrenheit thermometer, alcohol colored red, or even ether is used in the thermometers in very cold places. This kind of thermometer marks degrees as low as 100° below zero. The alcohol thermometer cannot be used for temperatures above its boiling-point, which is 80° Centigrade.

Temperature

The ideal room, or indoor temperature is about 68° to 70° Fahrenheit, with about 50 per cent. of humidity or moisture. If the temperature of the room drops toward 60° Fahrenheit, the probability is, we have already taken cold before we notice the change. If the temperature in an artificially heated room rises towards 76° or 78° Fahrenheit, the air we breathe is vitiated, contaminated and rendered unhealthful, and becomes a breeding-place for bacteria.

The normal temperature of the human body in health, is usually 98.6° Fahrenheit. In summer and winter, regardless of the changes of the surrounding atmospheric temperature, the temperature of healthy persons seldom varies more than one degree of temperature.

A GAME TO PLAY AT A PARTY

TWO captains, A and B, are chosen, who in turn select their teams. The players all gather around a long table, one team on one side with its captain at the head, the other team on the opposite side, headed by its captain. A quarter is the only thing necessary for the game.

A's side takes the coin first and passes it under the table from one hand to another, without being seen by the opponents. One member of the team takes the coin and conceals it in the palm of his hand in such a way that when the hands are placed on the table, the others cannot tell where it is.

The captain (B) of the opposing side then calls, "Jenkins says, Hands up!" when all the members of A's team must bring their hands up, with fingers tightly closed, and place their elbows on the table. B's team may then look over the hands and try to locate the coin which is hidden in one of the hands. After a few minutes of guessing, the captain then gives the order, "Jenkins says, Hands down!" when all hands must be slammed flat on the table, palms downward. Each one tries to make as much noise as possible to hide the sound of the coin as it strikes the table.

The object of the game is for the opponents to guess under which hand the coin is hidden. B's side then consults as to where the coin is, judging by the look of the hands. The captain of the guessing side then orders the hands not holding the coin to be removed one at a time, specifying whether it is the right or left hand that is to be lifted.

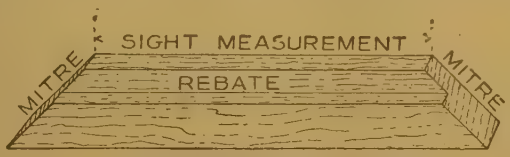
If the guessing side is successful in eliminating all of the empty hands so that the coin is left under the last hand, then that team wins, and the coin is passed over to B for the next round. If a player obeys the orders of a member of the opposing team who is not the captain, his side forfeits a point. If the coin is disclosed before the last hand is reached, then the side holding it adds to its score the number of hands remaining on the table that were not ordered off. The side that scores the greatest number of points in a given time is winner.

A PICTURE-FRAME THAT A BOY CAN MAKE

IT is not a difficult matter to frame a picture, but the work requires care and accuracy. The wood of a picture-frame is called the picture-frame molding. This molding is sold in lengths of 6 feet, or longer.

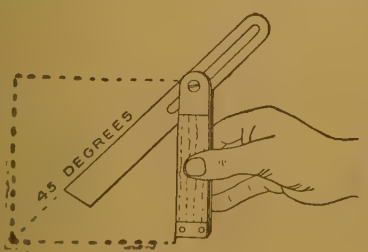
If you look at the end of a piece of picture-frame molding, you will find that, whatever may be the shape of the ornamental surface which will be visible when the picture is framed, there is at the back of it what is called a *rebate*, but what we may describe as a sunken edge all along one side. When the picture is framed this sunken edge is put on the inside next the picture, so that it forms a regular depression all round in which the picture and the glass lie. Picture 1 shows a piece of molding cut at the ends to the shape required for making a frame, and illustrates the rebate.

In an ordinary picture-frame the molding is in four pieces, the top and bottom pieces being exactly alike in length, and the two sides being exactly alike in length. The ends of the different pieces are not cut square across, but are cut to an angle of 45 degrees. Although most people know what an angle of 45 degrees means, it may be well to explain it. The corner of a square is a right angle. If from one corner of a square to the opposite corner of the same square we draw a straight line, we divide the right angle into two equal parts, and each half is an angle of 45 degrees. Builders of Modeltown have had explained to them on page 481 how to make angles of different sizes, and by following the instructions given there it will be easy to draw an angle of 45 degrees when we wish to cut the picture molding into the necessary lengths. The carpenter who wishes to mark wood to an angle uses a bevel, such as is seen in picture 2.

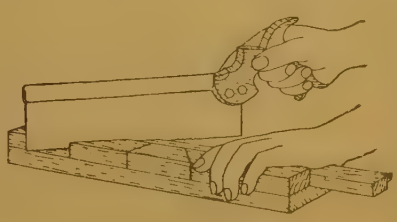


1. Picture-frame molding cut to shape

A neat picture-frame depends upon the neatness of the mitres or corners, and the ends must be sawn very exactly and put together very exactly. If the molding is a plain one with a surface that is flat or nearly flat, it may be quite possible to cut the corners to the proper angles; but if the molding has an irregular or ornamental surface, then this may not be possible without using an instrument which is called a mitre-block, such as is shown in picture 3.



2. Using the bevel


3. Using the mitre-block

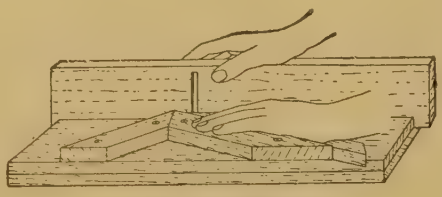
A plain mitre-block consists of two pieces of wood nailed together, both of the same length, but the lower one a little wider than the upper one. The sizes are unimportant. Through the narrowest piece saw-cuts are made to guide the saw as shown in the picture. Two of these are at an angle of 45 degrees, sloping opposite ways. The middle one is square across, for square cutting. The molding rests on the lower part of the block, and is pressed against the edge of the upper narrower piece while it is being sawn. A mitre-block may be purchased at a tool-shop or one may be made. It should be made of hard wood, such as beech.

The sizes for the four pieces of molding are, of course, taken from the picture itself. The inside or rebate edge of the molding is about a quarter of an inch shorter than the side of the picture where it is to touch. This allows the extreme edge of the picture to go into the rebate. This length of the inside edge of a piece of molding is called the sight measurement, because upon this depends the size of the picture that will show within the frame.

The mitres when sawn are not accurate enough to fit each other as perfectly as is necessary for neat appearance, and therefore a plane should be used after a saw. To do this properly, another special appliance, called a mitre-shoot, is required. Picture 4 shows how it is used. The plane is slid on its side, and the molding bears against a piece of wood put on at the angle of 45 degrees. This ensures the mitred ends being planed to the correct angle, and if the plane-iron is set carefully it will cut square in the vertical direction Without a mitre-shoot it is quite possible to plane or pare the mitres accurately, but it is not easy, and there is risk of injury to the edges of the molding. Plain molding that can be turned over on its face on the mitre-shoot may have both its ends planed in the position shown in picture 4 on the next page, but generally it is necessary to turn the shoot round and work the plane with the left hand for one end. Mitre-cutting machines are very useful, but are regarded as too expensive for anyone who is not constantly framing pictures.

Frames are held together by glue and nails at their corners, and also by paper,

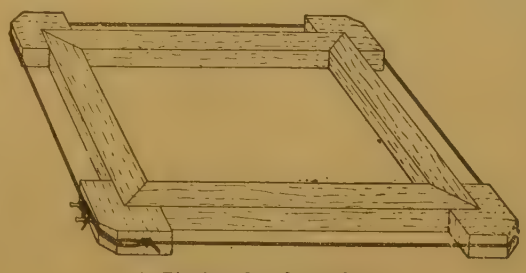
which is generally glued either round the edges or all over the back to keep out dust and strengthen the frame. After the mitres are cut, the four pieces should be placed in position, to be sure that all the corners fit properly. There are then two different ways in which the gluing and nailing may be done. Of course, if corner-cramps or an entire frame-cramp is to be used, that will simplify the work; but we will suppose the frame is to be put together without these appliances. The simplest, quickest, and roughest way is shown in picture 5. One piece of molding is gripped in a vice tightly enough to resist the force of hammering the nails into its end, and then the glue is applied and the next piece of molding held in position and nailed to it. The best vice for the purpose is an iron one, but a piece of wood or cardboard should always be put between the iron jaw and the outer edge of the molding in order not to injure the latter. On the inner edge the vice-jaw grips in the rebate where marks of the vice on the wood will not matter. Fine wire nails should be used, and holes bored for them with a bradawl through the first mitred piece, and slightly into the end grain of the second. As the hammering is likely to cause the first mitred piece to slip inward a little at the joint, the nailing should begin with the first piece too far out. A side and end of the frame are joined in this way, and then the other side and end similarly. After this the two remaining corners may be done without the vice, if preferred, but to avoid risk of injury to the joints already secured it is safest to continue with the vice.



4. Using the mitre-shoot

5. Joining the corners

The other way of putting a frame together is first to glue the parts and then cramp them together, leaving them for a few hours until the glue has set before putting in the nails. This is slow, and some means of cramping is necessary, but a neat result is more certain, for by the other method the parts are liable to shift out of exact position while the nails are being driven.



6. Binding the picture-frame

Without special cramps the simplest way to bind the frame together while the glue is setting is to make four blocks to fit the corners, and to tie string round the outside as shown in picture 6. A flat surface is cleared to lay the frame on; glue is applied to all the mitres; they are quickly placed together with the blocks outside, and then the string is tied round as tightly as possible. Sometimes it is not tied very tightly at first, but means are provided for straining it after. The method of tightening shown in picture 6, however, is easy and satisfactory for ordinary work of moderate size. A loop is formed at one end of the string, and the other end is pulled through this, so that it can be strained tightly simply by pulling. It is then necessary to secure the end of the string to prevent it from loosening again. This can be done by winding it a few times round nails in one of the corner-blocks as shown.

If glass is used it must fit easily into the rebate. The picture is placed face down on the glass, and generally a sheet of clean brown paper is placed on the back of the picture. Then the backboard, which is a thin piece of wood of the same size as the glass, is put in and secured by driving fine wire nails horizontally into the molding, leaving their heads standing out a little way, so that they keep the backboard pressed against the picture-back. Brown paper is generally pasted either over the joints only or over the entire backboard and frame.

Unmounted pictures—that is, pictures on thin paper not mounted on cardboard—are liable to become wrinkled, and will not lie evenly against the glass if they are put in dry. Therefore, the backs of such are always damped, and allowed a few minutes in which to stretch before the backboard is put in. This should press firmly on the picture, and as the later dries it becomes strained and always remains quite flat.

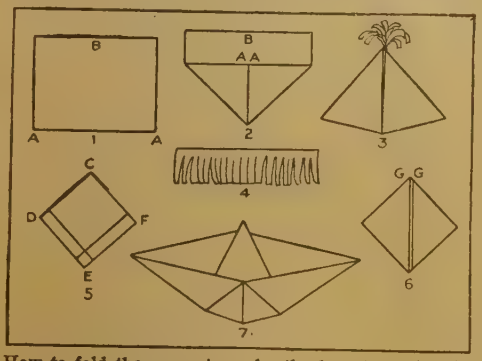
It is much easier to make a frame if metal corner-cramps are used. These hold the corners more securely than the wood blocks in picture 6, and the nails can be driven without waiting for the glue to dry. By the method shown in picture 5 there is no waiting, but it is not easy to nail the frame together accurately in that way. A very useful appliance is a combined mitre-block and corner-cramp. With this, and a fine saw, the corners can be fitted without the use of a plane or chisel. Professional picture-frame makers use a form of cramp which grips all four corners of the frame at once, and ensures its being square.

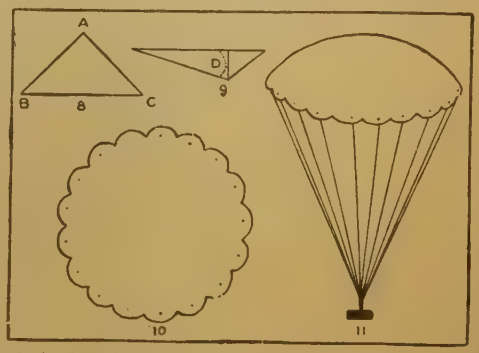
WHAT TO DO WITH A PIECE OF PAPER

A HAT, A BOAT, AND A PARACHUTE

HAVE you ever tried how many toys can be made out of a sheet of paper? With a little practice and skill we can convert a plain sheet of paper into any one of quite a number of delightful little toys. Shall we begin with the simplest of all, and learn to make a paper hat like that which you see in picture 3?

Take a sheet of paper—either plain or colored, or even newspaper will do—about nineteen inches long and fourteen inches wide; fold it in half to look like picture 1; turn up the corners A A until they meet below B as in picture 2; turn down the top pieces marked B, one on the one side of the triangle and the other on the other side. Arrange the corners that stick out neatly by tucking one inside the other, and the hat is complete.





How to fold the paper to make the hat shown in picture 3, the boat in picture 7, and parachute in picture 11

To make a cockade for our hat, cut a strip of paper as shown in picture 4, fold it in three, and push it in between the folds as in picture 3.

A paper boat is built up from a paper hat. When the hat is complete, we hold each side of the triangle in the middle with the thumb and first finger of each hand, and carefully pull out until the figure becomes square (double, of course,) as in picture 5. Turn up the corners E, one on the one side and the other on the other side, to meet point C, so that we again form a triangle. Once more hold the sides of the triangle and pull out to form a square as in picture 6. Finally, hold corners G G with thumb and first finger of each hand and gently pull out right and left until the boat is complete, as in picture 7.

Another very simple toy to make is a paper parachute. Take a smooth, square piece of tissue-paper and fold it from corner to corner, making a triangle as in picture 8. Fold corner C to B; again fold in the same way from corner to corner and fold in half as in picture 9. Take a pencil and mark curved line as shown by the dotted line in picture 9; then, with a pair of sharp scissors cut through all thicknesses of the paper round this line. Bore a hole at D with a stiletto; open out the paper, when it will look like picture 10.

We must now get sixteen threads of cotton of equal length; fasten one through each hole in the paper, bringing the loose ends together below. Fasten these together and attach a small piece of cardboard or stiff folded paper as ballast. Our parachute is now complete, and if taken out of doors on a windy day it will sail up a considerable height.

HOW TO MAKE A LAVENDER BOTTLE

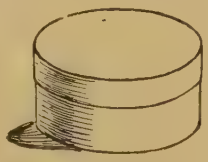
IF you want to make a lavender bottle you must buy a bunch of the sweet-smelling lavender—that is, if you are not fortunate enough to have a bush of it in your garden.

Cut off the head of the lavender sticks and place them in a small piece of cotton-wool about four inches long. Roll up the cotton-wool and tie it tightly round with a piece of cotton, keeping the top and bottom tighter than the centre. This is the foundation of the bottle. Then take an uneven number of the lavender sticks, 9, 11, or 13, and cut them to exactly the same length. Place the ends of the sticks round the rolled-up piece of cotton-wool, about half an inch down, and tie them very firmly round with cotton. Then bend the long ends which are left back over the whole length of the cotton-wool, and tie them firmly at the end of this, keeping them about the same distance apart round the centre. Next you must take a piece of "baby" ribbon of any pretty color, about two yards long, and, with the help of a bodkin, thread it in and out the sticks—under one and over the next, round and round from top to bottom until the whole of the cotton-wool is completely covered. Be very careful not to get the ribbon twisted or the effect will be spoilt. Finish off the ribbon firmly at each end with a needle and cotton, and cover it with a little ribbon bow of the same color. Tie a piece of ribbon round the ends of the sticks, about a couple of inches from the bottom, and your lavender bottle is finished.

THE WANDERING COIN

WE can make a box which has the power to make a silver quarter of a dollar placed within it disappear at command, coming back when we desire that it shall do so.

To start with, we must get a pill-box of wood or cardboard, as seen in picture 1, and of such size that a quarter lying flat inside it will exactly cover the bottom. If the box is of cardboard it will serve as it is, but if it is of wood we must line it inside at the bottom with paper, pasted down smoothly. For the sake of uniformity, it is as well to line the inside of the lid in the same way. We must then take a quarter, and cover one side of it with the same sort of paper, trimming it nicely round the edges. The coin thus treated will on one side look like an ordinary quarter, but on the other like a mere round of paper or cardboard.



1. The coin box

To show the trick, we borrow a quarter. After it has been handed to us, we say that someone may like to see the box, and we hand it round for inspection. While the general attention is thus occupied, we secretly exchange the borrowed coin for the prepared one. This we must have concealed beforehand in the right hand, held, by bending the fingers slightly, against the lower joints of the second and third fingers. We lay the prepared coin, papered side downwards, on the table where all can see it. The borrowed quarter we deposit secretly somewhere just out of sight, but where we can instantly get at it again when we want it—say, behind a book or other object that lies handy. It is suprizing how small an object will serve to screen a coin, provided that the table is between ourselves and the company, as it should be when we are conjuring.

2. The tin tube

Having got so far, we take the open box in the left hand, and the prepared quarter between the forefinger and thumb of the right, taking great care to keep the uncovered side towards the company assembled in front of us, and place it in the box, but in doing so we tilt it so that this side shall fall forward. It will therefore lie with the papered side uppermost. We now close the box, and shake it up and down several times, which makes the coin rattle, and proves that it is still there. "Quarter, go!" we then command, and shake the box again, this time from side to side, in which direction the coin has no room to move, as it fits the box and so cannot rattle. "It is gone!" we say, and, opening the box, we allow anyone to look into it. Seeing the paper side of the coin, they take this to be the bottom of the box.

"Now," we say, "I will bring the quarter back again." We close the box, saying, "Come!" Again we shake it, this time up and down. The coin is once more heard to rattle, having apparently returned from its wanderings. "It has come back, you see!" We open the box, and turn the quarter quickly out into our hand, into which it will fall with the papered side downwards. All present take it for granted that it is the borrowed quarter, for which we must again exchange it, gaining opportunity to do so by once more inviting the spectators to examine the box, which, as you know, can tell no tales.

This is a very good trick as it stands; but we can produce a still greater effect with it by apparently conjuring away the quarter from the box altogether, and reproducing it somewhere else. One very good way is to produce the real borrowed quarter, marked so as to prove that it is the same, from the very middle of a ball of wool. For this purpose we will need another little piece of apparatus, which again we can manufacture for ourselves. To do so, we take a piece of tin 3 inches long by 2¼ inches wide, and fold down its longer edges so as to form a sort of flat tube, just large enough to let a quarter slip easily through it. The edges will be a little apart, as in picture 2. On one end of this tube we must wind Berlin wool so as to form a ball, the opposite end of the tube sticking out an inch or so, as in picture 3. The wool should be of the heavy kind that ladies make antimacassars of, and wound lightly. This ball, which should be about 3 inches in diameter, we put in one of our side-pockets, or, if we find it more convenient, we may have it in a bag on the table or in a drawer behind it.

3. The ball of wool with tube

Now for its use in the trick. When we have borrowed and exchanged the quarter as already described, and the box has been examined, we say, "Now I should like you also to see whether you find anything suspicious about this ball of wool." As we say this, we put the right hand, containing the borrowed quarter, into the pocket or the bag or drawer in which we have concealed the ball, drop the quarter down the tube, and draw out the tube. It will need a little practice to do this with one hand; but if we have taken care to wind the wool lightly we will

soon be able to manage it. As we take out the ball, we squeeze it to close up the opening left by the tube. The ball now may be freely handled, for the coin cannot escape till the wool is again fully unwound from the middle.

When we work the trick in this way, instead of making the quarter reappear in the box, we order it to pass into the ball of wool, which we then hand to someone to wind off, say, round a book or card.

AN EASY WAY TO MEASURE THE HEIGHT OF A TREE

THERE is a very easy way to measure the height of a wall, or a tree, or a church spire, that any boy or girl can use if he or she can do a sum in simple proportion. It is necessary that the sun should be shining at the time—that is all. Suppose that we have a tree, and the sun is shining, then the shadow of the tree is cast on the ground. We must measure the distance from the extreme point of the shadow to the place right under the top of the tree. If the top point of the tree is right above the middle of the trunk, then we must calculate half the diameter of the trunk in making our measurements. Suppose that the distance from the point of the shadow to the trunk of the tree is 40 feet, and that the tree is 2 feet thick, then the total distance is 41 feet (40 feet plus half the diameter of the tree). Now we take a stick, of which we know the exact length. Suppose that it is 3 feet long. We hold this upright with one end on the ground and notice how far its shadow extends. Then we measure the length of the stick's shadow, and perhaps find that it is 6 feet long. Now we multiply the length of the tree's shadow (41 feet) by the length of the stick (3 feet), and divide by the length of the stick's shadow (6 feet). The answer we get is 20½, and we know that the tree is 20½ feet high.

The height of a tree shown by its shadow

If we get odd inches in our measurements, we can work the sum out in inches instead of in feet. We can also get the answer—though not quite so correctly—by seeing how many steps it takes to go from the edge of the shadow to the tree, being careful to make our steps as nearly uniform as we can. Then, by measuring the length of one step, we can multiply its length by the number of steps, and find the distance. But in any measurement, whether it be a tree or a church, or a wall, we must make sure that we take the distance to a point immediately under the highest point, so that if it be a church spire, for instance, we must make allowance for the distance between the wall up to which we measure and the centre of the church tower.

WHAT TO DO IN A THUNDERSTORM

THERE are some people who, when they hear the roll of thunder, are terribly alarmed, and run to hide themselves in a dark cupboard or cellar. These people are often laughed at for their fear, and, as a matter of fact, there is not the slightest danger to be feared from thunder, which is simply the report and echo of the electric spark caused by a discharge of electricity between two clouds, or between a cloud and the earth. But, on the other hand, we should be on our guard against lightning, for there may be danger from the flash.

It is always useful to know what to do in a thunderstorm. First of all, if we are indoors, the best thing to do is to keep away from those things that are good at conducting electricity, and might conduct it to us. Heated air, smoke, and soot are good conductors, and so also are metal grates, fenders, and fire-irons. Therefore, we should not stand near the fireplace. It is wise also to keep away from the window, because of its iron bolts and fastenings. Mirrors are good conductors, because of the quicksilver on their backs. The safest part of a room during a thunderstorm is the middle, and it is always good to stand on a thick hearthrug if the lightning is very powerful, as a dry rug, being a bad conductor of electricity, would insulate our body—that is, prevent the electricity passing to it.

If we are out walking, it is foolish to go and take shelter under a tree; in fact, it is unwise in a thunderstorm to stand near any tall object, which is a poor conductor of electricity.

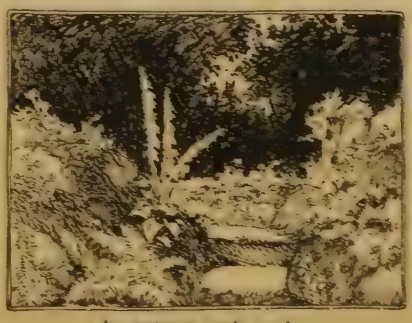
It is not dangerous to stand near a lightning conductor, as some people think, for the electricity would pass down the metal in preference to anything else.

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO IN THE MIDDLE OF NOVEMBER

THERE is some delightful gardening work that may be reserved for this late season of the year. Already in this part of our book we have spoken of the pleasure of growing Alpines, or mountain plants. There is a wonderful charm in making a fitting home for these little plants that love the high ground and the cold of the bitter Arctic regions, where for months they lie buried under the snow, and then, as soon as it has left them uncovered, make a rapid growth and burst into masses of flowers.

Of course, we understand that in the far northern Arctic regions, and also on the bleak mountain-sides, the winds and weather are sometimes terrific. That is a point to notice, and as a result of it, through long, long ages, it will be found that for the most part these plants are very dwarf, so that the winds cannot break and destroy them. Many of them are beautiful creeping things that lie along the soil and grip it tight with sturdy and numerous roots, for only thus could they exist. Therefore, when we make our rock garden or garden of Alpines, we shall expect masses of dwarf plants that make dense patches of bright and beautiful color.



An autumn rock garden

Another point to consider before we come to the practical making of our rock garden is to realize that plants that love to grow on the steep sides of a mountain will be plants that like good drainage of moisture from them, and certainly should not be asked to grow in low, moist, water-logged spots. You can understand that if you stand and water a hillock some of the water runs away down the sides. Now, though we must not have drainage as sharp as that, or our plants will be burnt up in summer, yet we should try to raise the position somewhat above the level, and we may use pieces of stone or clinker to help us to make a fitting home for the plants. The stone or clinker is useful in many ways—it helps to make a beautiful sitting for our plants; it helps to keep the soil cool and moist for them in summer, as they get their roots well under it where it is cool and comfortable; and not least is it useful for those plants that like to cling to the stone and gradually creep and cover it.

And now, with these words to introduce so interesting a subject as the making of a little bit of rock garden, we will consider a few important practical matters.

We will suppose you wish to devote a third portion of your little plot to this purpose, and unless it be very small it is always picturesque to have a pathway running through the rock garden, so that you have your plants growing on both sides of you as you walk along. If you like, the pathway can be dug out, and this may have very decided advantages, because the soil you thus throw up, as long as it is good enough, will help to give you a raised slope on either side of your pathway. You need not dig it all to the same depth, so that, if you wish it, you could make a step or two; these are always pretty additions.

Alpine plants, although so dwarf above the soil, often have curiously deep rooting habits, so that you will see this additional soil is useful in giving them depth of root-run. When it comes to putting the stone or clinker into place, you must bear in mind that it must not merely be laid on the surface, but embedded in the soil for a few inches. Just as far as possible you want to make the rock—that is to say, the stone, or, if that is not to be obtained, the clinker, which is much cheaper—appear as if it were really in masses under the soil, showing through here and there, to give it quite a natural look.

When you place your stone or other material, always begin at the bottom of your slope, and work upwards. Never make too steep a face to the slope; throw it back in ledges, as, though the plants do not like cold, wet positions for winter, they require plenty of water during the summer months, and if the face of the slope be too steep very little reaches them as it runs off, as we have already seen.

You need not wholly finish the making of your rock garden before you begin planting. Often it is more convenient to plant as you go along. Especially is this the case with plants that you want to establish between two stones placed fairly close together. You should take a stick and ram the soil quite firmly around plants that are to be planted in these *fissures* as they are called, because the soil settles down, and if it is not round the roots in ample quantity, of course, the roots are left bare in this settling process, and when a dry time comes the plant will die.

These may seem unimportant matters, but it is in the little things that success is to be obtained. No detail is too small to heed.

There are a few questions we do well to ask ourselves at the time we are establishing our plants: Am I giving this plant a position in which it has a sufficient depth of earth to root in? Am I placing it so that nothing overhangs, and it is able to benefit by the refreshing showers of rain? For of course it is most important to know that the moisture does not run off through some opening between the stones. Another point to remember is never to work at the making of a rock garden when the soil is so wet that it sticks together in lumps and hangs to the tools.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2031.

WHAT OUR LESSONS TEACH US

HERE, in the Reading lesson, we learn something about the meaning of words. The Writing lesson teaches us how to join letters together to make words. In the Arithmetic lesson this time we are shown how to add large numbers together. In the Music lesson we must bear in mind that the word Semibreve means whole-note; Minim means half-note; Crotchet means quarter-note; and Quaver means eighth-note. The Drawing lesson teaches us to draw with both hands, and in the Picture-Stories in French we read how the party spend their first morning in Paris.

CONTINUED FROM 1732

READING

THE MEANING OF WORDS

DO you know what a Dictionary is? If you do, and if you have ever looked inside one, I expect you will have thought it a very dry book, and soon put it down. But a Dictionary really is a very interesting book. For it tells us all about the meaning of words, and how they came to mean what they do.

Have you ever wondered why one word means one thing, and another word means something quite different? Isn't it funny that BREAD never means CHEESE? Why doesn't it? Why was bread called bread, and cheese called cheese? Well, the Dictionary tells us all this, and a great deal more besides.

Now let us make a little Dic-tion-ary of our own, to help us in our reading lesson. Here it is with pictures:

All these words come in the Twenty-third Psalm, and many of you, I expect, have learnt it off by heart. Remember that it was written by David, who was a shepherd before he became king. So he knew what he was writing about. King David wrote as if he were a sheep, and God was the shepherd leading him. Shall we try part of it?

The Lord is my SHEPHERD: I shall not want.

He maketh me to lie down in green PASTURES.

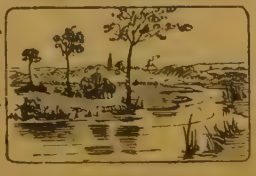
He leadeth me beside the STILL WATERS.

He restoreth my soul. He guideth me in the PATHS of righteousness for His name's sake.

SHEP-HERD—A man who takes care of sheep.

PAST-TURES—Green fields where sheep can feed.

STILL WA-TERS — A quiet stream, flowing very gently.

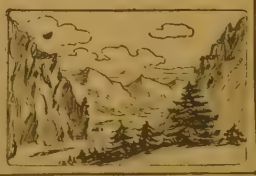


PATH—A way across fields, made by many people or animals walking on it.

ROD—A long stick.

STAFF—A shepherd's crook.

VAL-LEY — Land lying between hills or mountains on both sides.



Yea, though I walk through the VALLEY of the shadow of death, I will fear no evil; for Thou art with me.
Thy ROD and Thy STAFF, they comfort me.

As we have been talking about a shepherd and sheep, it will be nice to read some words that Jesus said about sheep, too:

"I am the Good SHEPHERD: the good SHEPHERD layeth down his life for the SHEEP. He that is a hireling, and not a SHEPHERD, whose own the SHEEP are not, beholdeth the WOLF coming, and leaveth the SHEEP and fleeth, and the WOLF snatcheth them and scattereth them. I am the Good SHEPHERD, and I lay down my life for the SHEEP."

By this time I am sure you will have learnt the words shepherd and sheep, and will know them whenever you come across them in a book. So that we are now getting on to quite long words, and in our next lesson we will learn some more.

WRITING

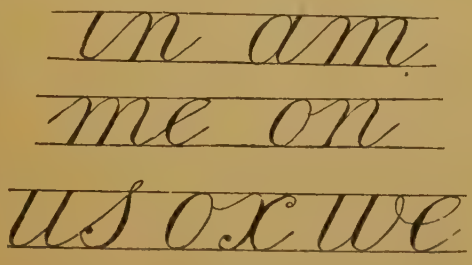
LEARNING TO WRITE LITTLE WORDS

"NOW that we have written all the small letters, we must see that we have not forgotten any one of them, so first it will be a good plan to write each of them once," said Tom's mother.

Of course, they both knew the alphabet, so this time they wrote the letters in order—a, b, c, and so on. Their mother was quite pleased with the way they wrote them.

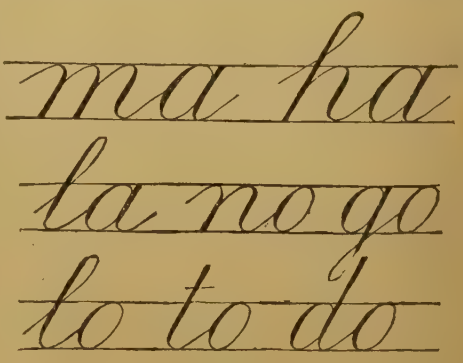
"That is good," she said. "Now we are going to put the letters together to make words, for the letters in a word join on to one another, just as we join hands when we play some of our games.

"Here are some small words. You know all the letters, but watch how I am going to join them."



Tom and Nora wrote a line each of the words in, am, me, on, us, ox, we, and found all these words easy to write, one letter joining on nicely to the next.

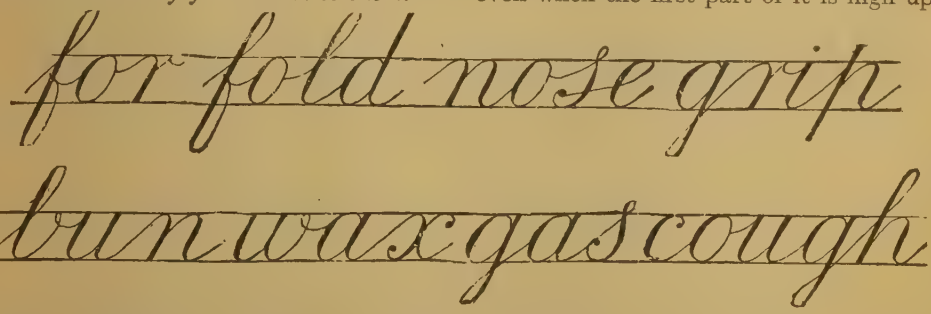
Then they were shown that when starting a word with o or a the joining was simple, but when another letter came before o or a the pencil had to follow round the upper part of o or a to reach the starting-place for the letter. Their mother wrote a number of little words for them to look at and to copy.



These little words, ma, ha, la, no, go, lo, to, do, had to be written again and again before Tom and Nora joined the first letter neatly on to a and o, but when they could do it their mother said she would show them how b, v, r, and w, the letters with little curly tails, joined on to a letter to follow, like this:

"Look," said their mother, "how r has to make friends with its neighbor a in ran, and how o sends out a nice long line to w in vow. You see, if they are going to spell a word properly, they all make friends and help each other, so that when we look at ran or vow we know the word at once. Just see how nicely v and w are holding the hands of o, just as if they tried to help it along,

as you help Baby when he tries to walk. Sometimes our pencils have to make long lines to join letters together. Here are some words like that, and we will see how nicely you can write them."



While Tom and Nora wrote these words—for, fold, nose, grip, bun, wax, gas, cough—their mother pointed out how g joined on to a in gas, and on to r in grip, but quite differently on to h in cough, where the joining line had to reach up to start the loop of h.

"Look carefully at the s in nose," she said. "You see, o naturally ends near the upper line, but the pencil has to come from there to start s. Now, as we cannot mistake s for another letter, even when the first part of it is high up, the line from o is carried to the top of s."

Nora said she thought the letters were all very nice to help each other in such a friendly way.

Both Nora and Tom, of course, knew how to spell their names, so their mother said they should try to write them and bring them to the next writing lesson.

ARITHMETIC

ADDING BIG NUMBERS TOGETHER

IN our last addition problems, the "ones" added together made a "ten" exactly. Let us try one now in which they do not make an exact "ten."

Add together 58 and 35.

As we did before, we will use the boxes to help us at first. The number 58 means that we must have 5 bundles of ten in the left-hand box, and 8 "ones" in the right-hand box, like this: [5] [8]. To add 35 to this number, we must put three more bundles in the left-hand box, and 5 more "ones" in the right-hand box.

We shall then have 8 bundles in the left-hand, and 13 "ones" in the right-hand, [8] [13]. But we know we must never have more than 9 in the right-hand box; so, from the 13 "ones" we make a bundle of ten and carry it to the left-hand box.

We shall now have 9 bundles in the left-hand box, and there will still be 3 "ones" in the right-hand, [9] [3].

Thus, by adding 35 to 58 we get 93.

To write the problem, we set it down as before, with the "ones" under the "ones" and the "tens" under the "tens."

58 Then say 5 and 8 make 13.
35 Put down 3 (ones) and carry 1
— (ten). Next, 1 and 3 make 4,
93 and 5 make 9. Put down 9.

We have now found out what we mean by "carrying." Whenever the two figures in the "ones" column make as much as ten, we "carry" the "ten" to the "tens" column and add it with the figures in that column.

In the same way that we never keep more than 9 "ones" in the "ones" box, so we do not keep more than 9 "tens" in the "tens" box.

We use a third box, which is placed on the left of the "tens" box, and call it the "hundreds" box. Then, whenever we get ten bundles of ten, we tie them into a big bundle called a *hundred*, and put it into the "hundreds" box.

Suppose the figures on the three boxes are [2] [8] [7]. The number of

things in the boxes is 2 hundreds, 8 tens, and 7 ones. We call this "two hundred and eighty-seven." So 509 is called "five hundred and nine." What are the names of the following numbers: 354, 750, 548, 934, 706?

It is just as easy to write down the figures for any number, when we are given its name. For example: "four hundred and thirty-three" would be 4 hundreds, 3 tens, and 3 ones; that is 433.

"Three hundred and five" means 3 hundreds, 0 tens, and 5 ones; so that the figures for it are 305.

Write down the figures for:

Seven hundred and sixty-three.
Five hundred and fifty-five.
One hundred and four.
Six hundred and seventy.

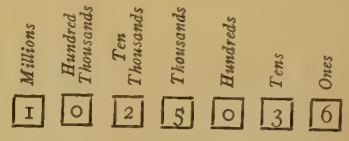
A group of ten hundreds is called a *thousand*. So again we shall require another box on the left of the "hundreds" box, called the "thousands" box. Then, since we must not have more than 9 thousands in that box, we must tie the ten thousands into a "ten-thousand" bundle and put it into a "ten-thousand" box, and place it on the left of the "thousands" box.

We can understand now how it is that, however big a number of things we may have, the ten figures, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, are quite enough for us to be able to write down what the number is. We never put as many as ten bundles into a box, but tie the 10 into a bigger bundle, and give this bundle a new name and a box of its own.

Instead of "boxes" we generally speak of "places," and so have the ones or *units* "place," the tens "place," the hundreds "place."

The names of the different bundles, starting from the "ones" place at the right, are "ones," "tens," "hundreds," "thousands," "ten thousands," "hundred thousands," "millions." We can go still further, with "ten millions," "hundred millions," and so on, using all the names over again and putting them in front of the word "millions," until we come to "million million." A million million is called a "trillion," but we scarcely need trouble about any more of these names, because we shall not very often want such very big numbers.

So, going only as far as millions, we have the "places" arranged like this:



If the figures in the different places are those just written, the number is 1 million, 2 ten thousands, 5 thousands, 3 tens, 6 ones, and is called "one million, twenty-five thousands, and thirty-six."

What is the number 32541? Since we have not the names of the "places" written over the figures, we must count them up. Begin at the 1 and say "ones," then go to the 4 and say "tens," then to the 5 and say "hundreds," and so on. When we get to the figure 3 we shall have said "ten thousands."

So, we know the number is 3 ten thousands, 2 thousands, 5 hundreds, 4 tens, 1 one, or, as it is called, "thirty-two thousands, five hundred and forty-one."

Read 709106. If we reckon up in the same way, we find this is "Seven hundred and nine thousand, one hundred and six."

What are the following numbers? 3072, 52901, 70612, 538124, 6028, 1190123?

To write down the figures which stand for a given number, we have only to be careful to put down 0 for any "place" which is empty. Thus, "three hundred and seven" means 3 hundreds, 0 *tens*, 7 ones, and the figures are 307.

Write in figures "seventy thousand and twenty-two." This means 7 ten thousands, 0 *thousands*, 0 *hundreds*, 2 tens, 2 ones, so the figures are 70022.

As long as we are careful to think of *all* the names, "ones," "tens," and so on, as far as they are wanted, and fill in as many of each as are in the given number, *remembering those of which there are none*, we shall not make mistakes.

Write these in figures: Three hundred and twenty-eight thousand, two hundred and thirty-seven.

Fourteen thousand and nineteen.

Seven thousand nine hundred.

One million, two hundred and four thousand, and eighty.

KING SEMIBREVE AND HIS COURT

ONCE upon a time there was a king in fairyland, very big, very important; in fact, he was so big and so important that the only thing to do was to give him a long name. And so he was called King Semibreve. His banner bore this strange device 𝅝.

He had two knights who followed him in close attendance, and they were called the Lords Minim. The flag they carried was like this 𝅗𝅥, but because they were only half as important as King Semibreve, they always had to go together whenever they were to represent the king. So a well-known proverb in fairyland is: "It takes two Minims to be equal to one Semibreve." When the royal trumpeters announced King Semibreve, they blew their golden trumpets four times; but when the Lords Minim took the place of the king, the trumpeters gave two blasts for each lord, because one Lord Minim was only worth half one King Semibreve. You see, in fairyland, the fairy who is worth the most in himself is the king.

King Semibreve equals.....2 Lords Minim

King Semibreve equals.....4 Masters Crotchet

1 Lord Minim, who is equal to

2 Masters Crotchet

In this land we are getting to know so well, little black people and little white people play quite happily together, and in this tale we read that sometimes good King Semibreve became a little tired of his two faithful Minims, and he would say: "My good little Minims, you are rather tired to-day, so I am going to give you a holiday," and before another word could be spoken the two Lords Minim had disappeared, and in their place stood four little black boys 𝅗𝅥 𝅗𝅥 𝅗𝅥 𝅗𝅥, and the trumpeters blew separate blasts from their pretty trumpets, and all the fairies sang together: "Four little black boys shall represent our good King Semibreve to-day, the masters Crotchet shall they be named!" Bowing very low before the king, the four little boys marched away, feeling very important, because, throughout fairyland, trumpeters with golden trumpets proclaimed the news:

King Semibreve
wishes to rest,
Two Minims a
holiday take;
So four little Crot-
chets are best,
And the trumpets
are blown for
their sake.

The trumpeters had to be very careful to make no mistake. If King Semibreve appeared, they must blow their trumpets four times, and a little fairy, carrying a flag like this 𝅝, would sing, as only fairies can, 1—2—3—4. If Semibreve did not appear, the little men with the trumpets would look anxiously, and directly the two Lords Minim arrived on the scene the little fairy would be quite ready to sing 𝅗𝅥 𝅗𝅥 1–2 3–4, two blasts for each minim; but if the little Masters Crotchet were going to do the honors of the day, then again would be heard the fairy's voice calling out 1—2—3—4, and as she sang each number a little black head

would come up through the ground, till four little black boys were all in a row.

You see, the password for the day was always the same, 1—2—3—4. King Semibreve, the all-great, the all-powerful, had 1—2—3—4 all to himself.

The Lords Minim had to divide the song between them, so Lord Minim I. said 1—2, while Lord Minim II. laughed out 3—4. They knew their song must join, or it would not be long enough for the great King Semibreve.

The merry little black boys had one number each, so when they sang one after the other, 1—2—3—4, it was quite like a pretty peal of bells, and when they thought of it altogether, they knew their song was equal to the song of King Semibreve himself.

It is quite clear that whenever we want to talk about King Semibreve we must count 1—2—3—4, or we shall never find this all-important monarch at home. If we think we would rather have a little time with my Lord Minim, we must remember his number is 1—2; and supposing we want the gay, wee black boys, we must imitate this pretty peal of bells, and sing out 1—2—3—4.

So we have much to think of—the all-important king named Semibreve, the lords named Minim, the little black boys known as Crotchets, ready and willing to carry out any order that may be given to them. The large and lofty hall known as the Hall of Sound is the favorite meeting-place of our fairies. There the Lords Minim are often to be found; if we want the merry black Crotchets we seek them there; and if we are fortunate enough to be in the hall when the great King Semibreve inspects this corner of his kingdom, we shall see two of the Minims rise and salute him, and gravely will King Semibreve salute in return. Next, four little Crotchets will rise and salute the great Semibreve, receiving with due solemnity his dignified salute in return.

There we must leave them for to-day, but very soon we shall learn a game the fairies play, which has much to do with the story we have been reading.

DRAWING

HOW TO DRAW WITH BOTH HANDS

HAVE you ever tried to draw with both hands? It is a good plan to practise making big curves and long lines with the left hand as well as with the right. If you have a blackboard, you can stand a little way off and draw from your shoulder; that is how an artist stands at his easel. If there is no blackboard in your house, you can pin a sheet of paper to the wall and try drawing on that. The wall is not as good as a blackboard, because it does not slant; besides, you can draw over and over again on a blackboard, because you can rub it quite clean with a duster.

This is how our chalk drawing should look when finished

But whether you have a blackboard or only a sheet of paper, try a little of this sort of drawing to-day.

Take a short piece of chalk in each hand, put your hands rather close together, and as high as you can reach on the board or paper, standing your arms' length away from it. Now swing your arms round and downwards and let them meet at the bottom.

Have you made two nice curves, each as good as the other? Try again, for it is splendid exercise. Don't rub the first lines out if you are using paper, but draw the new lines over them, as this is only for

practice. Next try first one hand, and then the other; then try to draw a shield the shape you see in the picture. Begin by holding your hands rather wide apart at the top, swing them round, and join the lines in a point at the bottom and join the dots at the top with a straight line. When you have practised this a little, you can get a sheet of paper, quite as large as your drawing-board will hold, pin it firm with four drawing-pins, and get two pieces of black chalk or charcoal, some colored chalks, or your paint-box, brushes, and clean water. Remember to slant the board so that it slopes down towards you.

St. George's Cross, to be painted in red

Shield, to be painted in two colors

Now make two dots with the chalk about three inches down from the top of the paper. Do you remember how much an inch is? Try to guess three inches down. The two dots must be wide apart, each one about two inches from the side of the paper. Look at the picture to see where to put the dots. Take a piece of chalk in each hand. Let them be small pieces, so that your hands can rest on the paper.

Now hold the chalk in your left hand on the left-hand dot, and the chalk in your right hand on the right-hand dot. Keep your hands firmly on the paper, and swing them downwards, meeting in a point near the bottom of the paper, and half-way from each side.

If you hold your hands firm, and the chalk not too tight in your fingers, you will make a nice line. Never make lines with pencil or chalk so hard that you can see the mark on the other side of the paper when you turn it over.

Join the dots at the top with as straight a line as you can, and then put another dot in the middle of this line. Guess the middle first, and then see if the two halves are the same, by measuring; alter the dot if they are not, and when it is right make another line down to the point at the bottom. Then cross it by another line from side to side about in the middle of the shield.

Now, if you like, you can make a St. George's Cross, by making each of these lines double, as in the picture, and chalking or painting the cross red, as St. George had it on the shield when he fought the Dragon. Or you can paint two of the divisions red and two others blue, or any color you would like your shield to be, if you were a knight going out to fight.

Moisten the paper first. If you have made it too wet, use some clean blotting-paper till it is only just damp, and does not shine anywhere. Take plenty of color in your brush and paint downwards. If you use a mixed color, like green, mix a good saucerful before you begin, because you will not be able to mix exactly the same shade of color again.

Blue and yellow make green.

Red and blue make purple or violet.

Red and yellow make orange.

Red, yellow, and blue make black and grey.

These are four important things to remember.

LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English word. Third line: As we say it in English.

C'est notre premier jour à Paris. Nous nous éveillons de bonne heure.
This is our first day at Paris. We ourselves awake at good hour.
It is our first day in Paris. We awake early.

La bonne tire de côté les rideaux. Elle dit: "Le jour est superbe."
The nurse draws at side the curtains. She says: "The day is superb."
The nurse draws aside the curtains. She says: "It is a beautiful day."

Nous faisons vite notre toilette. Puis nous descendons à maman.
We make quickly our toilet. Then we descend to mamma.
We dress quickly. Then we go downstairs to mamma.

Nous avons du café au lait et des petits pains. Nous avons bientôt fini.
We have some coffee with milk and some little breads. We have soon finished.
We have coffee and rolls. Soon we have finished.

Nous voulons aller nous promener. Nous courons pour obtenir nos chapeaux.
We wish to go ourselves to promenade. We run for to obtain our hats.
We want to go for a walk. We run to get our hats.

Nous rencontrons une petite fille. C'est notre petite amie du dernier soir.
We encounter a little girl. This is our little friend of the last evening.
We meet a little girl. It is our little friend of last night.

Nous disons tous: "Bon jour!" Nous disons que nous allons nous promener.
We say all: "Good day!" We say that we go ourselves to promenade.
We all say: "Good morning!" We say we are going for a walk.

Elle dit: "Puis-je vous accompagner?" La bonne répond: "Oui, certainement."
She says: "May I you to accompany?" The nurse responds: "Yes, certainly."
She says: "May I go with you?" The nurse replies: "Yes, certainly."

Nous marchons vers les boulevards. Ils ressemblent aux parcs de Londres.
We march towards the boulevards. They resemble to the parks of London.
We go towards the boulevards. They are like the London parks.

Le nom de notre petite amie est Julie. Elle a une balle. Nous faisons un bon jeu.
The name of our little friend is Julia. She has a ball. We make a good game.
Our little friend's name is Julia. She has a ball. We have a good game.

Il est presque l'heure du déjeuner. Nous devons aller chez nous.
It is nearly the hour of the lunch. We must to go to the house of us.
It is nearly lunch-time. We must go home.

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 2227.

THE MAID OF SARAGOSSA

CONTINUED FROM 1821

FROM early spring to late autumn had the French soldiers been swarming over the Pyrenees. Murat had come to Spain, and the great Napoleon himself had followed, to work his will on the throne of Spain and to make his brother Joseph king of the country. Napoleon, however, had not counted on the most important thing of all, the national spirit of patriotism among one of the fiercest peoples of Europe, and he found the whole country up in arms against him, unorganized and without discipline, it is true, but the spirit of hatred for the foreign invader was more than he could crush with one blow.

In the summer the French troops besieged Saragossa, and a terrific contest ensued. On August 2, 1808, feigned attacks were delivered at two of the city's gates, and an avalanche of shells was directed from a powerful battery, called San Engracia, against a convent of that name, slaying all the defenders, and rendering it powerless. An envoy from the French general brought the following message to Don José Palafox, the commander of the town. "Headquarters, San Engracia. Surrender." He replied as briefly: "Headquarters, Saragossa. War to the knife." The citizens supported him, declaring: "We will defend ourselves to the death, and perish rather than surrender." Then the terrible hand-to-hand conflict went on. Barricades were erected, and the Spaniards defended their town with such a will that, before eleven days had passed, the French withdrew, disheartened by their terrific losses.

Glad of the respite, the inhabitants set to work and re-fortified their city, preparing for the long siege that was sure to come. On December 20, the French army again appeared before Saragossa, and for two months another siege went on. But famine and fever were at work in the city, and the survivors were forced to make an honorable capitulation.

It was during this second siege that Augustina, better known as the Maid of Saragossa, won for herself a heroine's fame. Her lover had fallen in his battery, and she resolved to take his place. In the picture above we see her holding the lighted brand, about to start the fuse on the cannon.

Don José Palafox, the commander of the city, and an Augustin friar are pointing the gun which rests on the battlements of San Engracia convent. Many are the heroic deeds that the Maid of Saragossa performed in the siege, and her memory is honored in this city on the banks of the Ebro as much as that of Don José Palafox, the heroic commander of the city.

THE ELSIE TO THE RESCUE

THE Larchmont, a large side-wheel steamer with three decks and a capacity for immense loads of freight, left her dock in Providence at seven o'clock one mid-winter night. She was bound for New York and carried a heavy cargo and scores of passengers.

A strong northwest wind was blowing as the craft ploughed her way down through the eastern passage of Narragansett Bay, but the full effect of the gale which was blowing out in the Sound, was not felt until the Larchmont rounded Point Judith. Then the side-wheeler pointed her nose full into the icy blast, and continued down through Block Island Sound without any unusual incident until she was well abeam of Watch Hill and within five or six miles of Fisher's Island.

The captain, who had remained in the pilot-house until the vessel had straightened out on her course, took a final turn around the vessel to see that all was well. Satisfied with his inspection, he was preparing to retire when he heard the pilot blow a number of sharp, short blasts on the whistle, the usual warning of danger. He hurriedly redressed and rushed into the pilot-house, and the pilot and the quartermaster pointed out a three-masted schooner bearing down upon them under the strong wind.

The pilot told the quartermaster to put the wheel hard aport, and the latter, keeping his head, did as he was ordered. As the Larchmont was slowly veering round in response to her helm, the schooner came rushing on and even before another warning signal could be sounded on the steamer's whistle, she crashed into the port side of the Larchmont.

The impact of the vessels was so terrific that the big bow of the sailing craft ate its way more than half the breadth of the Larchmont. When the force of the impact had been spent, the schooner temporarily remained fast in the vitals of the steamer, holding in check for a moment the inrushing waters. Then the pounding seas separated the two boats and the flood poured in. Almost at the same time, one of the steam-pipes on the Larchmont burst, and clouds of steam burst forth, adding to the confusion. The engine stopped suddenly and the vessel began to fill with water.

The passengers, startled from their sleep by the shock of the collision, rushed to the decks. Few even waited to clothe themselves. Their fear was so great that the first penetrating blast of the gale was disregarded. When suffering from the elements became intense, it was found impossible to return below for clothing. The staterooms were flooded, and the steamer, floundering around in the big seas, was sinking rapidly.

The captain promptly ordered every one to his post and gave additional orders that the boat crews should go to their stations, make the boats ready and swing them for instant use. There were eight boats and four life-rafts on the Larchmont. No other boat was in sight that could aid the stricken vessel, so the order was given for the passengers to pile into the boats. Men and women bumped into each other, struggling for a chance of safety. Once the boats were cut away, the pitiable condition of the passengers and crew was increased rather than lessened. Every wave sent a dash of spray over the boats, and soon a thin coating of ice enveloped every one. Even those—and they were few—who were fully clothed, suffered from frozen faces and numbed feet.

Fisher's Island, the nearest land, was nearly five miles westward of the spot where the collision occurred, and every boat at once tried to head for that place. But the boats were heavy and the men at the oars weak. A fierce gale blew on their backs as they strained at the ice-covered oars in their endeavor to make land. The boats and rafts soon became separated.

As the Larchmont slowly settled, thirty of the passengers and half a dozen of the crew who could not get into the boats gathered on the hurricane deck, the highest part of the vessel. When the steamer went down, this deck with its human freight was ripped from the hull by the wind and tossed into the raging sea. The temperature was rapidly falling below zero, and the raging, icy waves swept over the huddled group on the raft until

Copyright, 1918, by M. Perry Mills.

at last only eight exhausted, half-frozen survivors clung to the wreckage.

In the meantime, one of the boats from the Larchmont with a few survivors in it had reached Block Island, and news of the disaster spread. Many of the islanders volunteered to do battle with the surf on the rocky shores in the chance of rescuing any survivors who might drift in in boats or on pieces of wreckage. Some of the fishermen actually set out in the gale towards the scene of the disaster. Among these was Captain John W. Smith and seven other daring men.

For hours, his little boat, the Elsie, fought its way into the ocean, until her decks and rigging were covered with ice from the seas that swept over the bow. At ten o'clock they sighted the raft and saw that its occupants were feebly signaling for help. Try as she would, the Elsie could not get near the raft. At last four of the fishermen climbed into the dory that the Elsie was dragging in tow, and though drenched by the icy spray until they were numb, they fought their way to the raft and lifted into the dory eight scarcely living forms, whose clothing had frozen upon them.

After two more awful hours, the Elsie reached land with every one on board almost helpless from the cold. One of the rescued died from the exposure of that horrible night, and all the crew of the Elsie were frost-bitten, though none was permanently disabled.

Each of the fishermen, who had been engaged in the rescue of the survivors of the Larchmont, was awarded a gold medal by the Carnegie Hero Commission, about which we may read in our book, and the education of their children was provided for from the funds controlled by that organization.

A BRAVE GIRL

ONE bright spring afternoon, a party of young people was rambling through the woods of Pennsylvania. The warm air rang with chatter and laughter as they wandered here and there, picking flowers. Soon they began to separate into little groups, according as flower gathering, bird hunting or other tastes directed them. They had arranged to meet for a picnic supper at the stream up below Rock Falls and in the meantime felt free to roam as fancy led them. The voices grew more distant, sometimes a laugh rang out, sometimes the snap of a dry branch was heard, but the woods were becoming as silent as they had been before the invasion, when a startled cry broke sharply upon the stillness.

Its note was so keen and anxious, that as many of the party as heard it came running from various directions towards the spot whence the cry sounded. They found one of their number, who had been seeking a special fern, said to grow among the rocks in that locality, holding his arm—a horrified expression on his face.

"What is it?" inquired the first comers anxiously, and new arrivals repeated the inquiry, till an excited, chattering group collected on the spot.

In a momentary lull a low rattle was heard in the underbrush, and it seemed to loosen Billy's tongue.

"Look out!" he cried, half beside himself. "The snake! He has bitten me!"

The peculiar humming noise increased in intensity and pitch, and a chorus of shrieks and terrified exclamations broke from the girls, but the boys plunged into the bushes and killed the rattlesnake. Before they returned, one of the last of the party to arrive upon the scene, a brisk, capable young woman of twenty, took command of the situation.

"Here, Billy," she said, "take off your coat."

Half dazed with fear, Billy mechanically obeyed.

Then Mary Benton seized his shirt sleeve, and without waiting for knife or scissors, took it in her teeth and slit the sleeve to the shoulder. Close to the elbow, in the fleshy upper part of the boy's arm, the two small marks of the rattler's fangs showed red and angry. Mary looked at them without flinching, but the other girls began again their excited exclamations; and Billy's eyes wandered piteously around the group.

"What are you going to do, Mary?" sobbed one of the girls hysterically.

"Wait and see. And, for goodness sake, be quiet, or go away," returned the other shortly, for there was no time to lose.

Bending over the boy, she tied a handkerchief tightly around the arm

above the bite, applied her lips to the wounds and sucked out the poison. While she was giving all her mind to this, some of the boys went off to get the team hitched up to the cart in which they had come. Calmed by her example and coolness, the girls were doing what they could to help, and two of them volunteered to run to the nearest farm house and telephone for the local doctor to meet the team. Mary nodded briefly.

"Tell him what's wrong," she said, and went on sucking. At last she said: "Come, Billy, that's all right. Put on your coat and we'll soon be home."

The team had only gone two miles when they heard the doctor's motor coming up the hill ahead of them. Quick questions, answered mainly by Mary, and a look of relief succeeded the anxiety on Dr. Maylew's face.

"It is your promptness that has saved Billy's life, Miss Benton," he said. "What is that on your lips? A fever blister? Did you know you were risking your own life when you sucked Billy's arm?"

Mary nodded meekly. She did not feel so brisk and commanding now that the need for prompt action was over.

THE BEAR HUNT

GOOMA was a little Hindu goatherd. All his life he had lived with his grandfather in the hills and all his knowledge was of the hills. Sometimes he wondered what life was like in the great beyond, and particularly in Simla, whose white walls he could descry in the sparkling light. Twice in his life—red letter days—he had seen a party of riders, English men and women, winding up and down the *nullah*, or valley, that lay beneath his home, filling the early morning air with their bright chatter. As the days came and went on the quiet hill slopes, Gooma sent out into the future long thoughts, always colored with the brilliance of that gay cavalcade.

One night he sat outside the hut, listening to the sound of an approaching horseman. Indoors his grandfather slept. Gooma walked out of the shadow and waited with a beating heart. Was something about to happen at last—something to vary the eternal silence of the hills and the monotony of service? The horseman stopped. Although of martial bearing, he wore ordinary riding clothes and was unattended.

"Do you live here, boy?"

Gooma salaamed his reply.

"What is your name?"

"Protector of the poor, my name is Gooma."

"Well, now, Gooma, would you like to join me in a hunt?"

Gooma trembled so much with excitement that he could scarcely speak.

"A hunt, sahib?"

"Yes, a hunt. A bear has been seen on the summit of the mountain."

At the word "bear" the light went suddenly out of the boy's face. His eyes hurriedly swept the starry sky.

"Well?" demanded the stranger sharply.

"It is not wise, Huzoor, to hunt the bear," faltered Gooma.

"Oh, is that it? I see you're afraid. I'll go alone."

"But, Huzoor," continued Gooma, with a deep reverence, "the bear is not abroad to-night."

"What makes you say that?"

"Protector of the poor, the keepers of the bear are elsewhere. The bear does not emerge without his keepers."

The Englishman laughed. At the sound Gooma's face became impassive, inscrutable. He looked straight before him down the *nullah*, where the crescent moon was rising.

"Rubbish!" the stranger muttered as he rode away. "I've run up against some of their precious ideas. I'll wait a night, anyhow."

Gooma stood until the sound of the hoofs was silenced. Then he sought his straw pallet and flung himself across it. It was the first time one of those mighty white men, those beings from another world, had spoken to him, and Fate had arranged it should be on such a subject. Why didn't the great soldier understand? The memory of the laugh cut Gooma's heart. He sobbed in the darkness.

Three nights afterwards the great one reappeared. Gooma was in exactly the same spot. He rose and made a deep reverence. The man looked at him kindly.

"Well, have you changed your mind yet, Gooma?"

The boy made no reply.

"Will you come along and hunt the bear? I ask you because you know the hills better than any one. I will pay you."

"I cannot! If the sahib would only understand!"

The man's kindness was almost more than Gooma could bear. Why couldn't the great war lords comprehend without so much talking?

"Come and sit out here in the good moonlight, Gooma, and tell me why you're so mighty afraid of the bear."

"The sahib would only smile."

"I shall do nothing of the sort. Go ahead."

Gooma looked doubtfully at his companion. The hunter glanced at him and smiled frankly.

"Go ahead," he repeated.

Gooma squatted, native fashion, and began his story. As he spoke, to hide his embarrassment he took up a stone and polished his knife—the sharp, curved knife of the hillman that he always carried.

"It is a very short story, Huzoor. Long, long ago, before the sahib's country was, the animals were very powerful, and they had an overlord to rule them, who was apt to be forgetful. He knew that the bear was sacred, but he let slip the thought from his mind, and the bear began to have many enemies. His food was stolen day after day, and at last the bear sent a complaint to the overlord by the kind little *serow*."

"*Serow!* What is that?"

"A *serow*, Huzoor, in the times that were, long, long ago, was a bit like an antelope and a bit like a goat and a bit like a donkey. He was good-natured, and so he set off to find the overlord. On his way, however, he met great and powerful enemies, and the poor *serow* was hard pressed, and cried out in the fight. Suddenly, seven sisters, shining like moons, emerged from a wood close by and demanded the reason of the *serow's* cry. Having learned his story, they went on his way with him and found the overlord. The overlord listened to the seven shining sisters, and, as they were idle just then, gave them the particular power to guard the sacredness of the bear, here, on this very mountain. For many hundred years the seven shining sisters, shining like moons, Huzoor, guarded the bears on this hillside. Then came a period of great and terrible strife, when the gods were at war, one age passing to make room for another. The land was locked in blood, and many beings passed, never to return. Among the rest, the seven sisters fled to the safety of the sky, where they could watch the bear's interests. Look up beyond that jutting tree, sahib. There are the seven sisters."

"But," interrupted the hunter, "those are the Pleiades."

"Even so, Huzoor. And they guard the doings of the bear. It is unwise to raise the strife of ages, Huzoor. The seven sisters have ways of working their will."

The hunter glanced curiously from the sky to the impassive face by his side. There was a long silence, and then the Englishman mounted and rode slowly away, pondering.

"I'll keep an eye on that boy," he thought, "but in the meantime I fancy I'll hunt the bear without his permission."

Gooma watched many nights for the great lord to return. He shrewdly suspected that his story would not alter the hunter's decision a little bit. In Gooma's eyes, the man was dead already, and he was powerless to help. He could not disobey the tradition that had kept his race together for the sake of one man, however noble, of alien blood. The sahib would return, and would hunt, and nothing more would be heard of him. He was not the first. The mountain-top had always done its work well. Nevertheless, Gooma's brown eyes were very sad as he led his goats patiently up and down the slope morning and evening.

One night Gooma sat as usual in the shadow of the wall. He heard the horse's hoofs as the rider made a detour of the goatherd's hut. He knew. The sahib was riding to his death. Gooma tried not to listen, tried not to watch for the horseman to emerge from the trees that flanked the hill. He would have far to go up that lonely steep before he reached the usual haunt of the bear.

A sudden exclamation escaped him. He got up and ran outside the enclosure. Something was wrong. The hunter had dismounted. He could plainly hear in the dead stillness the dual sound of the progress. That was not wise, to dismount and walk leisurely in a track that the panthers occasionally chose for an eve-

ning stroll. A shot rang out, and then another.

In one minute Gooma fought the battle of his life. Should he go to the assistance of the white lord who was in the act of committing one of the greatest crimes in the Hindu calendar? He would never be forgiven by his own people. Then Gooma remembered the man's fine, brave face and soldier's courage. With a stifled prayer for forgiveness, he grasped his knife and ran. Up through the shrub tore his silent, bare feet. Somewhere death was being dealt. He sniffed the air, and a great joy flooded his brain. Whatever came, the bear was not about. The smell was not the smell of the dreaded one. He ran on and on.

He was just in time to see the terrible spring of a huge panther, and the officer's shot that maimed but did not kill. Both man and beast went down in the shock. The hunter was face down, and the long, lithe body was over him. Whistling through the air went Gooma's knife. It caught the glossy head, and a blood-curdling yell echoed and re-echoed through the peaceful valley. The panther rolled off his prey, and lay writhing in a death-agony. As Gooma rushed up, the hunter struggled, unhurt, to his feet. The sharp claws had only torn his coat. A revolver-shot silenced the cries of the great creature; and the sinuous form lay still.

In silence Gooma pulled out his knife from behind the dead beast's ear.

There was a pause, and then he spoke.

"So! Now the sahib must see the bear is defended."

Something stirred in the man's heart as he looked from the stiffening form a few feet away to the boy's faithful eyes.

"I'm going back, Gooma, but I shall not forget what I owe you. You shall enter my private service; is that not so?"

The boy burst into tears.

"Huzoor, I am thy faithful slave till death." Then a sudden thought struck him.

"The sahib will not want me to—"

"No, Gooma. Don't be afraid. I won't. You shall not hunt the bear!"

THE UNKNOWN SCULPTOR

CLANG, clang, tap, tap, clean and sharp through the still air of a great cathedral rang the sound of many hammers, of chisels dressing stone, and of chips of marble falling to the ground. There entered through a side door an old, white-headed man stooping under the weight of a bag of tools borne on his shoulders. His face was lined and careworn, but in his eyes was the light of a great peace. From one to another of the busy crowd of toilers went the old man, seeking work, until he came to the head builder, who, taking pity upon his age and weariness, led him to a dark corner of the church, and said that there he might carve until the work was done. Then the builder went upon his way, and sinking on his knees in the dim light, the old man prayed that his eyes might be keener, his fingers nimbler and his tools truer than they had ever been. "For in this darkness I shall need much help, O Lord," and rising from his knees, he went to his poor lodging to sleep.

Months passed by. Through summer sunshine, autumn rain and winter cold, the old man never failed at his appointed task. Day by day, he was first to reach the building, and last to leave, until he seemed to have become part of the work itself.

At length one day when the cathedral was almost completed, one of the workers noted that the old man's hammer was still, and, fearing that he was ill, went up the ladder to the scaffold where he worked. But soon he came quietly down the steps and told his fellows that the sculptor lay dead, his cold hands still holding the tools with which he had worked so faithfully. As they bore him reverently away to the place where he lodged, the chief builder came to the shadowy corner where the sculptor had toiled and was ashamed because he had left the old man there in the darkness. But as he turned to seek the sculptor's work, the setting sun shone through a window and fell in glory on the wall beyond, revealing in its golden light the scaffold, and the work of him who died beside it.

And to this day visitors to the great cathedral await the setting sun and stand in awe and reverence, as they gaze on a pure gem of a great master's art.

THE NEXT GOLDEN DEEDS ARE ON PAGE 2019.